QK1
.B956
1909

Kew.

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

1909.

LONDON:
PRINTED FOR HIS MAJESTY'S STATIONERY OFFICE,
By DARLING & SON, Ltd., 34-40, Bacon Street, E.

And to be purchased, either directly or through any Bookseller, from
WYMAN and SONS, Ltd., Fetter Lane, E.C.; or
OLIVER & BOYD, Tweeddale Court, Edinburgh; or
E. PONSONBY, 116, Grafton Street, Dublin.

1909.

Price Three Shillings and Sixpence.

CONTENTS.

No.	Article.	Subject.	Page.
1	I.	On some Species of Impatiens from Indo-China and the Malayan Peninsula	1
,,	II.	Australian Pasture Herbs	12
,,	III.	Plant Diseases.—IX. Dry Scab of Potatoes (*Spondylocladium atrovirens*) (with figs.) ...	16
,,	IV.	The Section Omphacarpus of Grewia in Africa	18
,,	V.	Miscellaneous Notes	22
2	VI.	Varieties of the Oil Palm in West Africa (*Elaeis guineensis*) (with figs.)	33
,,	VII.	Diagnoses Africanae : XXVII.	49
,,	VIII.	Injuries to Plants due to Hail and Frost (with plate)	53
,,	IX.	Lalang Grass (*Imperata arundinacea*) ...	55
,,	X.	The South African Bamboo (*Arundinaria tessellata*)	59
,,	XI.	New Orchids : Decade 33	61
,,	XII.	The Section Microcos of Grewia in Africa ...	66
,,	XIII.	Miscellaneous Notes	68
3	XIV.	The Flora of Ngamiland (with map) ...	81
,,	XV.	A Funtumia Disease (*Nectria funtumiae*) ...	147
,,	XVI.	The Herbarium Savatier	148
,,	XVII.	Miscellaneous Notes	150
4	XVIII.	The Economic Aspects of the Oil Palm (*Elaeis guineensis*)	161
,,	XIX.	Diagnoses Africanae : XXVIII.	184
,,	XX.	Peglera and Nectaropetalum	188
,,	XXI.	Notes on the Indian Species of Sambucus ...	191
,,	XXII.	Miscellaneous Notes	193
5	XXIII.	Makruss or Zimbiti (*Androstachys Johnsonii*) (with figs.)	201
,,	XXIV.	Fungi Exotici : IX.	204
,,	XXV.	Myrobalans (*Terminalia Chebula*)	209
,,	XXVI.	Diagnoses Africanae : XXIX.	212
,,	XXVII.	The Vegetation of the Pastasa and Bombonasa Rivers	216
,,	XXVIII.	Witches' Broom of Cacao (*Colletotrichum luxificum*)	223
,,	XXIX.	Miscellaneous Notes	224
6	XXX.	Effects of the Winter on Trees and Shrubs at Kew	233
,,	XXXI.	Notes on New Zealand Marine Algae ...	239
,,	XXXII.	Additions to the Wild Fauna and Flora of the Royal Botanic Gardens, Kew : IX. (with plate)	243
,,	XXXIII.	Decades Kewenses : LII.–LIII.	256
,,	XXXIV.	A Revision of the Genus Cycnoches (with plate)	268
,,	XXXV.	Miscellaneous Notes	277
7	XXXVI.	A Review of the known Philippine Islands Species of Impatiens	281
,,	XXXVII.	Toowoomba Canary Grass (*Phalaris bulbosa*)	289

No.	Article.	Subject.	Page.
7	XXXVIII.	Cucumber and Tomato Canker (*Mycosphaerella citrullina*) (with plate)	292
"	XXXIX.	Lignum Nephriticum (*Eysenhardtia amorphoides*)	293
"	XL.	Diagnoses Africanae : XXX.	305
"	XLI.	Kokoti (*Anopyxis eulaensis*)	309
	XLII.	Marine Algae of the West of Ireland ...	312
"	XLIII.	Miscellaneous Notes	315
8	XLIV.	Ecanda Rubber (*Raphionacme utilis*) (with plate and figs.)	321
"	XLV.	Diagnoses Africanae : XXXI.	325
"	XLVI.	Cornus macrophylla, and some Asiatic Congeners	329
"	XLVII.	Trees noted in Devonshire	335
"	XLVIII.	Coffee Diseases of the New World (*Sphaerostilbe flavida*) (with figs.)	337
"	XLIX.	Miscellaneous Notes	342
9	L.	Notes on New Trees and Shrubs (with plates)	353
"	LI.	Decades Kewenses : LIV.	357
"	LII.	The American Species of Microtropis ...	362
"	LIII.	New Orchids : Decade 34	364
"	LIV.	Additions to the Wild Fauna and Flora of the Royal Botanic Gardens, Kew : X. ...	369
"	LV.	Diagnoses Africane : XXXII.	376
"	LVI.	Canadian Wild Rice (*Zizania aquatica*) (with plate)	381
"	LVII.	The Manchurian Water Rice (*Zizania latifolia*)	385
"	LVIII.	Miscellaneous Notes	390
10	LIX.	Phytochemical Investigations at Kew ...	397
"	LX.	Diagnoses Africanae : XXXIII.	419
"	LXI.	Malayan Ferns	423
"	LXII.	Miscellaneous Notes.	424
Appendix I.	—	List of seeds of hardy herbaceous plants and of trees and shrubs	1
" II.	—	Catalogue of the Library. Additions received during 1908	21
" III.	—	New garden plants of the year 1908 ...	79
" IV.	—	Botanical Departments at home and in India and the Colonies	105

Errata.

Page 44, line 2 from top, *for* praebeus *read* praebens.
Page 44, line 3 from top, *for* idigena *read* indigena.
Page 60, line 15 from top, *for* glums *read* glumes.
Page 64, line 15 from bottom, for *Ormithidium* read *Ornithidium*.
Page 80, line 4 from bottom, *for* Parlatori *read* Parlatore.
Page 232, line 21 from bottom, *for* 1874 *read* 1784.
Page 240, line 17 from bottom, *for* Montague *read* Montagne.
Page 270, line 18 from top, *for* Steyner *read* Stayner.
Page 342, line 2 from top, *for* J. W. Gallagher *read* W. J. Gallagher.
Page 352, lines 8 and 9 from bottom, *for* Sutton *read* Suttor.
Page 392, line 7 from top, *for* Lancaster *read* Lamastre.

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 1.] [1909.

I.—ON SOME SPECIES OF IMPATIENS FROM INDO-CHINA AND THE MALAYAN PENINSULA.

J. D. Hooker.

When examining the contents of a rich collection of Chinese *Balsamineae*, liberally loaned to me by the authorities of the Paris Museum of Natural History for the purpose of collating the species with those in the Kew Herbarium, I found amongst them a considerable number that had been collected in the French possessions of Indo-China. These were of special interest as being the only ones known to me as natives of that country.* There were about 16 of them, and they appeared to me to differ so greatly from those of China proper, not only specifically but in sectional and in other characters as to suggest Indo-China being, in respect of *Balsamineae*, a different phyto-geographical area from that to the north of it. Further, a study of the *Balsamineae* of the Malayan Archipelago from Sumatra eastwards to Borneo, Celebes, the Moluccas, New Guinea, and the Philippines, proved that these did not harmonise with those of Indo-China. Two more Indo-Chinese have subsequently been received from the Herbarium of the Fribourg Museum, making 18 species to be discussed here.

To determine the relationship of the Indo-Chinese and Malayan Peninsula species of *Impatiens*, it is necessary to take into consideration those of the adjacent areas of China, Burma (including Assam), and the Malayan Archipelago. Siam should be included were its Balsams known, but only six species have been collected in that kingdom (by Dr. C. C. Hosseus); one of them is also a native of Yunnan, and the others are of Burmese type.

The Balsams of the Himalaya differ so greatly from those of other Indian areas that their inclusion would be valueless. Except

* Loureiro's "Flora Cochinchinensis," published in 1790, when probably the term Cochin-China was not that now understood, contains five species of *Impatiens*, all apparently either Canton or garden plants Two of these *I. Balsamina*, L., and *I. cornuta*, L., are forms of one. The others are too incompletely described for identification. None now exist in the British Museum, where Loureiro's herbarium is deposited.

(12002—6a.) Wt. 35—183. 1375. 2/09. D & S.

the ubiquitous *I. Balsamina*, not a dozen of the 80 or 90 Himalayan species have been collected elsewhere.

Japan, too, is of no account in this study; it presents the unexplained anomaly of containing only two species known to me, namely, *I. nolitangere*, which extends throughout N. Asia and Europe to the Atlantic, and *I. Textori*, Miq., which is also a native of N. China. An explanation may be found in its insect fauna.

The materials from which the following data have been obtained are contained in the herbaria of Kew, the British Museum, Paris, Berlin, Vienna, St. Petersburg, Holland, Edinburgh, New York, the Philippine Islands, Fribourg, and Le Mans, which have all been liberally placed in my hands for study. I may add that, with the exception perhaps of the Malayan Peninsula, each of the included areas may, in my opinion, be expected to contain perhaps twice as many species as have hitherto been collected in it. The number known to me in each is approximately as follows :—

China, 180 ; Indo-China, 18 ; Burma, including Assam, 70 ; the Malayan Peninsula, 12 ; the Malayan Archipelago, 50.

The following are the characters selected for the differentiation of the areas :—

1. INFLORESCENCE—pedicellate, when consisting of simple axillary pedicels, ebracteate or bracteate at the very base only ; in contrast with peduncled—the peduncles bearing one or more flowers with bracteate pedicels.
2. The absence of a BRACT at the base of the lowest pedicel of a two- or more-flowered peduncle (*I. nolitangere* is a species in which the lowest pedicel is ebracteate).
3. FLOWERS—the lateral sepals being four in number.
4. The distal lobes of the two WINGS being coherent or connate.
5. The ANTHERS being acute or acuminate.
6. FOLIAGE—the leaves being opposite or whorled (not alternate).

Other very important characters would be afforded by the staminal column, a comparatively minute structure, so contracted and deformed in herbarium specimens as to be in most species very difficult of analysis. The raphides, which abound in the leaves and often in the flowers of most species, are no doubt available for description, but many months of anatomical research would be necessary to utilize them for systematic work. So, too, with the nervation of the floral envelopes : this could be rendered available only by photographic representation through transmitted light. The anatomy of the leaves offers a rich field for research : it presents many various phases.

I have not included in the differentiation the remarkable character peculiar to a well-marked section of upwards of 20 Western Chinese balsams, which consists in the basal and often also the distal lobes of the wings being terminated by a very long flexuous filament of extreme tenuity, so fragile as to have been overlooked in descriptions of species belonging to the group.

					Total species in area.
i. Flowers simply pedicelled—					
Indo-China	16	...	18
Malayan Peninsula	7	...	12
China proper	14	...	180
Burma	23	...	70
Malayan Archipelago	30	...	50
ii. Lowest pedicel ebracteate—			
Indo-China	0	...	18
Malayan Peninsula	0	...	12
China proper	34	...	180
Burma	0	...	70
Malayan Archipelago	0	...	50
iii. Lateral sepals 4—			
Indo-China	3	...	18
Malayan Peninsula	1	...	12
China proper	25	...	180
Burma	7	...	70
Malayan Archipelago	0	...	50
iv. Connate distal lobes of wings—			
Indo-China	7	...	18
Malayan Peninsula	4	...	12
China proper	1	...	180
Burma	3	...	70
Malayan Archipelago	1	...	50
v. Anthers acute—			
Indo-China	0	...	18
Malayan Peninsula	0	...	12
China proper	40	...	180
Burma	1	...	70
Malayan Archipelago	1	...	50
vi. Leaves opposite and whorled—			
Indo-China	1	...	18
Malayan Peninsula	4	...	12
China proper	40	...	180
Burma	1	...	70
Malayan Archipelago	1	...	50

This table appears to indicate—

1. That the *Balsamineae* of Indo-China and the Malayan Peninsula conform, as regards the great preponderance of species with a simply pedicellate inflorescence; this is also the case in Burma and the Malayan Archipelago.
2. An absence of species having no bract at the base of the lowest pedicel of a peduncled inflorescence; this is also the case in Burma and the Malayan Archipelago.
3. The presence of species with four lateral sepals; as is the case in Burma and China, but not in the Malayan Archipelago.
4. The presence of a considerable number of species with coherent or connate distal lobes of the wings; as in three of Burma and one each of China and the Malayan Archipelago.

5. An absence of species with acute anthers, as in Burma and the Malayan Archipelago, in each of which only one has been collected out of 70 and 50 species respectively; in China proper, on the other hand, nearly one-fourth of the known species have acute anthers.

6. The solitary species with opposite or whorled leaves in Indo-China conforms to the condition of the genus in Burma and the Malayan Archipelago, in each of which areas only one of a large number of species shows this character; on the other hand, of the twelve Malayan Peninsular species four have opposite or whorled leaves, conforming with the Chinese area where species with this character are as numerous as those with acute anthers.

To conclude, the species of the Malayan Peninsula conform with those of Indo-China in all but one character, the sixth, and partly with that, and may be regarded as together indicating one and the same area, most nearly allied to the Burmese and very different from the Chinese.

How far these conclusions will prove aught but crude indications remains to be seen when fuller materials for their scrutiny shall be forthcoming.

Clavis Specierum.

A. Inflorescentia simpliciter pedicellata (pedunculo communi 0); pedicelli ebracteati v. ima basi tantum bracteati :—
Folia opposita v. verticillata :—
Folia et sepala linearia :—
Folia basi rotundata v. cordata 1. *I. chinensis*, L.
Folia basi longe angustata
2. *I. Griffithii*, Hk. f. & Thoms.
Folia et sepala ovata :—
Folia membranacea, vexillum obcordatum
3. *I. Curtisii*, Hk. f.
Folia firma, vexillum orbiculare
4. *I. Wrayi*, Hk. f.
Folia alterna ; sepala saepissime 2 :—
Alarum lobi distales liberi :—
Calcar elongatum :—
Alarum lobi dissimiles, sepala minima
5. *I. Balsamina*, L.
Alarum lobi consimiles apice obcordati :—
Alarum lobi sinu terminale mutici :—
Sepala 1-2 mm. longa 6. *I. Aureliana*, Hk. f.
Sepala 5 mm. longa 7. *I. diffusa*, Hk. f.
Alarum lobi sinu terminale aristati :—
Folia crenulata, sepala 3–4 mm. longa
8. *I. semounensis*, Hk. f.
Folia serrata, sepala 7 mm. longa
9. *I. attopeuensis*, Hk. f.

Calcar limbo labelli vix longius ; folia serrulata, sepala minuta ... 10. *I. indo-chinensis*, Hk. f.

Alarum lobi distales cohaerentes v. connati :—

Sepala ad medium v. altius connata :—

Folia lanceolata subserrulata, labelli limbus cymbiformis ... ... 11. *I. Harmandi*, Hk. f.

Folia ovata integerrima, labelli limbus hemisphericus ... ... 12. *I. zygosepala*, Hk. f.

Sepala libera :—

Caulis simplex plus minusve columnaris et cicatricatus :—

Folia ovata, crenata, utrinque 3–5-nervia ; sepala 10–12 mm. longa, labelli calcar brevissimum inflatum ... ... 13. *I. Boni*, Hk. f.

Folia ovata, crenata, utrinque 8–12-nervia ; sepala 12–14 mm. longa, labelli calcar modice elongatum ... ... 14 *I. Musyana*, Hk. f

Folia orbicularia, subcrenata, utrinque 4–5-nervia ; sepala 6–9 mm. longa, labelli calcar brevissimum inflatum ... 15. *I. pygmaea*, Hk. f.

Folia ovata, serrulata, utrinque 5–6-nervia, basi biglandulosa ; sepala 10–12 mm. longa, labelli calcar brevissimum 2-lobum 16. *I. verrucifer*, Hk.f.

Caulis ramosus :—

Folia utrinque 4–5-nervia :—

Folia late ovata, membranacea, crenulata ; sepala 6–7 mm. longa, labelli calcar breve incurvum... ... 17. *I. Ridleyi*, Hk. f.

Folia ovato-lanceolata, nervis obscuris ; sepala 7 mm. longa, cuspidata, labelli calcar breve incurvum... ... 18. *I. cryptoneura*, Hk. f.

Folia utrinque 8–13-nervia :—

Folia lanceolata, membranacea, serrulata ; sepala orbicularia, 10 mm. diam., labelli calcar brevissimum bifidum 19. *I. Lanessani*, Hk.f.

Folia lanceolata, crassiuscula, subserrulata ; sepala ovata, 10 mm. longa, labelli calcar limbum aequans incurvum bifidum 20. *I. Spireana*, Hk. f.

Folia ovato-lanceolata, membranacea, subcrenata ; sepala 10 mm. diam., labelli calcar 2-lobum lobis limbo scaphiforme semi-immersis ... ... 21. *I. macrosepala*, Hk. f.

B. Inflorescentia pedunculata ; pedunculi 2–∞ flori :—

Sepala 2 :—

Perennis, caulis obesus, folia decidua 10–20 cm. longa, alarum lobi distales leviter cohaerentes 22. *I. mirabilis*, Hk. f.

Herba ramosa, folia 2–5 cm. longa, utrinque 3–6-nervia, pedunculi 2–4 flori, sepala ovata 3 mm. longa 23. *I. Capusii*, Hk. f.

Herba caule simplice, folia 10–12 cm. longa, utrinque 8–10-nervia, pedunculi 3–5-flori, sepala oblonga 9 mm. longa 24. *I. oncidioides*, Ridley MSS.

Sepala 4 :—

Folia 12–16 cm. longa, nervis utrinque 8–14, pedunculi pauciflori ... ... 25. *I Scortechinii*, Hk. f.

Folia 10–15 cm. longa, nervis utrinque 5–6, pedunculi multiflori ... ... 26. *I. claviger*, Hk. f.

Folia 10–16 cm. longa, nervis utrinque 9–12, pedunculi multiflori ... ... 27. *I. Balansae*, Hk. f.

Specierum Habitationes, &c.*

1. **I. chinensis**, *Linn. Sp. Pl.* 937.

Indo-China ; Tonkin, *Sergent Moulet* in Herb. Mus. Paris.

2. **I. Griffithii**, *Hk. f. et Thoms* in *Journ. Linn. Soc. Bot.* iv. 320.

Peninsula Malayana ; Johor, Mont. Ophir, rupibus graniticis, alt. 1520 m., *Griffith*, *Cuming*, *Ridley* in Herb. Kew.

3. **I. Curtisii**, *Hk. f.* in *Rec. Bot. Surv. Ind.* iv. (1906) 55.

Herba annua, glabra, ramulis gracilibus foliisque novellis supra hirtellis. *Folia* 6–10 cm. longa, opposita et alterna, suprema saepe 3–5-natim verticillata, petiolata, membranacea, ovata, acuta v. acuminata, minute denticulata v. crenulata setis minutis interjectis, supra laete viridia, subtus glaucesentia, basi cuneata interdum setis glanduliferis ciliata, petiolo 3–7 cm. longo gracillimo, nervis utrinque 10–12 ; glandulae infra-petiolares 0. *Pedicelli* solitarii, 3–5 cm. longi, gracillimi, ebracteati, fructiferi elongati. *Flores* 2–2·5 cm. expansi, pallide rosei. *Sepala* 2, 3–4 mm. longa, ovata v. ovato-lanceolata, acuminata, 3-nervia. *Vexillum* amplum, cuneatim obcordatum, costa gracile sinu mucronata. *Alae* ad 10 mm. longae, sessiles, profunde bilobae ; lobus basalis late obovatus, apice truncatus retusus, sinu mucronatus ; auricula dorsalis obscura. *Labelli* limbus scaphiformis, late ovatus, 2·5–3 mm. longus, acuminatus : calcar gracillimum, pendulum, 2–2·5 cm. longum. *Filamenta* brevissima, late linearia ; antherae late didymae, obtusae. *Ovarium* ovoideum, rectum, acutum. *Capsulae* ad 1·5 cm. longae, gibbosae, fusiformes v. ellipsoideae, utrinque attenuatae, obtusae, polyspermae. *Semina* immatura 2 mm. longa, obovoidea, compressa, minute papillosa, pallide brunnea.

Peninsula Malayana ; Perak, Mont. Thaiping, rupibus graniticis, alt. 900–1250 m., *Curtis*, *Scortechini*, *Ridley* ; Larut, *Hort. Bot. Calc. mercenarii* in Herb. Kew.

4. **I. Wrayi**, *Hk. f.* in *Rec. Bot. Surv. Ind.* iv. (1906) 55.

Herba annua, glabra v. ramulis foliisque novellis hirtellis ; caule 30 cm. alto gracile ramoso. *Folia* 5–8 cm. longa, opposita v. superiora ternatim verticillata, petiolata, crassiuscula, ovata v. oblongo-lanceolata, acuminata, integerrima v. spinuloso-serrulata, subtus glauca, basi in petiolum 2–2·5 cm. longum angustata, costa subtus crassa, pilosa, nervis utrinque 8–10 ; glandulae infra-petiolares et-sitpulares 0. *Pedicelli* 3–5 cm. longi, solitarii, ebracteati, fructiferi elongati. *Flores* ad 2·5 cm. expansi, rosei, disco coccinei. *Sepala* 2·5 mm. longa, late ovata, longe cuspidata, crassiuscula, 3–5-nervia. *Vexillum* orbiculare v. oblate obovatum, costa dorso medio rostrata apice cuspidata. *Alae* ad 2 cm. longae, sessiles, 2-lobae ; lobus

* In the following pages only such species are described in detail as have not been so treated previously. Two of the 12 Malayan Peninsula species (p. 3), having been made known only after this article was in type, shall be described in a future issue.

basalis oblongus, decurvus, obtusus; distalis ter longior, obcordatus; auricula dorsalis obtusa. *Labelli* limbus scaphiformis, 1·5 cm. longus, ore aristulato; calcar 3 cm. longum, gracillimum, rectum. *Filamenta* brevissima, linearia; antherae connatae, obtusae. *Capsulae* 2 cm. longae, ellipsoidae, utrinque breviter attenuatae, apice obtusae, polyspermae. *Semina* 3–4 mm. longa, ovoidea, compressa, pilis articulatis operta.

Peninsula Malayana; Perak, Batang Padang, rupibus calcareis, alt. 600 m., *L. Wray* in Herb. Kew.

The specimens are in poor condition: Mr. Wray notes that the flowers are pink with a crimson centre.

5. **I. Balsamina**, *Linn. Sp. Pl.* 938 forma hortensis.

Indo-China; Laos, *M. Maffie* in Herb. Mus. Paris.

The indigenous state of this plant, which is frequent throughout the warmer parts of India under various forms, has very recently been found in Sumatra.

6. **I. Aureliana**, *Hk. f.* in *Hook. Ic. Pl.* t. 2851.

Indo-China; *Pr. Henri d'Orleans* in Herb. Mus. Paris.

This dwarf species was collected in the Prince's adventurous journey from Indo-China to Burma, but in what locality is not recorded.

7. **I. diffusa**, *Hk. f.*, sp. nov.

Herba 2–3 cm. alta, glaberrima, flaccida, parviflora, caule succulento basi diffuse ramoso, ramis ramulisque gracilibus. *Folia* 0·5–12 cm. longa, alterna, petiolata, carnosula ?, exsiccata membranacea, ovata v. oblonga, acuta v. acuminata, indistincte crenata setulis interjectis, basi cuneata marginibus nudis v. ciliatis, in petiolum 2–3 cm. longum gracilem angustata, nervis utrinque 5–7 gracillimis. *Pedicelli* ebracteati, florentes folio breviores, fructiferi elongati. *Flores* ad 1 cm. expansi; raphides 0. *Sepala* 2, ovata v. ovato-rotundata, 5 mm. lata, mucronata, nervis laxe reticulatis. *Vexillum* trigonum, angulis rotundatis, 6–8 mm. latum, costa dorso alata apice mucronata. *Alae* sessiles, 8 mm. longae, alte bilobae, lobis erectis obcordatis sinubus muticis; auricula dorsalis parva, basin versus alae. *Labelli* limbus scaphiformis, ovatus, 7 mm. longus, in calcar gracile rectum 2 cm. longum attenuatus, ore ascendente apice rotundato mucronato. *Filamenta* brevia; antherae minutae, didymae, obtusae. *Ovarium* oblongum, obtusum. *Capsulae* fusiformes, 10–15 mm. longae, rectae v. gibbosim falcatae, medio tumidae, obtusae, polyspermae. *Semina* oblonga, 3 mm. longa, laevia, pallide castanea.

Indo-China; Sing Fung, *Dr. Harmand*, 89, in Herb. Mus. Paris.

I do not find the locality given for this species in any available atlas.

8. **I. semounensis**, *Hk. f.* in *Hook. Ic. Pl.* t. 2852.

Indo-China; sinu Semoun, muris templi ripis flum. Seng-treng, *Dr. Harmand*, 89 in Herb. Mus. Paris.

9. **I. attopeuensis**, *Hk. f.* in *Hook. Ic. Pl.* t. 2853.

Indo-China; Laos, sinu Attopeu, montibus 600 m. altis, *Dr. Harmand* in Herb. Mus. Paris.

10. **I. indo-chinensis**, *Hk. f.* in *Hook. Ic. Pl.* t. 2854.

INDO-CHINA; Otacamund (Cambodia ?) alt. 1830-2130 m., *Pierre* in Herb. Mus. Paris.

11. I. **Harmandi**, *Hk. f.* in *Hook. Ic. Pl.* t. 2858.

INDO-CHINA; *Spire* in Voyage de *Dr. Harmand*, 346 in Herb. Mus. Paris.

12. I. **zygosepala**, *Hk. f.* in *Hook. Ic. Pl.* t. 2857.

INDO-CHINA; Cambodia, Kampoh, rupibus calcareis, *Geoffray* in Herb. Mus. Paris.

13. I. **Boni**, *Hk. f.* in *Hook. Ic. Pl.* t. 2860.

INDO-CHINA; Tonkin, Thongsan et Kienkhe, *Bon*, 286, et Dick Long, monte Soi, *Bon*, 2879 in Herb. Mus. Paris; Dong Harn inter rupis, *Bon*, 2086 in Herb. Mus. Fribourg.

14. I. **Musyana**, *Hk. f.*, sp. nov.

Herba humilis, succulenta, glaberrima, caule 5–6 cm. longo simplice robusto cicatricato inferne nudo. *Folia* 5–10 cm. longa, alterna, petiolata, crassiuscula, ovata, acuta v. obtusa, crenato-serrata, basi acuta, petiolo 1–4 cm. longo raro apice biglanduloso, nervis utrinque 8–12. *Inflorescentia* simpliciter pedicellata; pedicelli solitarii, 3–4 cm. longi, basi ebracteati. *Flores* 3–5 cm. expansi, roseo-violacei, intus flavi. *Sepala* 4; 2 exteriora ovata v. ovato-rotundata, cuspidata, 12–14 mm. longa, firma, opaca, multinervia, nervis reticulatis; 2 interiora minima, vix 1 mm. longa, oblonga, cuspidata, firma. *Vexillum* obovato-oblongum v. obcordatum, apice bilobum, 15–18 mm. longum, galeatum, recurvum, costa firma dorso infra medium alte carinata apice sinu rostellata. *Alae* amplae; lobi basales 1·5–2·5 cm. longi, late falcatim obovati, incurvi; distales in laminam amplam orbicularem 2–2·5 cm. diam. integram connatae; auriculae dorsales parvae, arcte cohaerentes. *Labelli* limbus cupularis v. alte cymbiformis, ore oblongo acuto 2–2·5 cm. longo horizontale; calcar breve, robustum v. subinflatum, 8–10 mm. longum, rectum v. incurvum. *Filamenta* linearia; antherae in capitulum globosum inclinatum connatae. *Ovarium* leviter curvum, accuminatum.

INDO-CHINA; Tonkin, Mont. Soi, Deitslong, *Bon*, Herb. Miss. Tonquini occident., 2879 in Herb. Mus. Fribourg.

The flowers of the specimens of this species, kindly loaned by Prof. Musy, of Fribourg, at the request of the Director of Kew, are in a dilapidated state. They are remarkable for the great size of the wings, of which the distal lobes are connate, forming an orbicular lamina sometimes one and a quarter inch broad; and adding to these the basal lobes which are produced upwards for one-third the length of the united distal, the whole breadth of the wings is nearly 2 inches. On the accompanying ticket indited "Herbarium Missionis Tonquini occidentalis" Father Bon adds "Planta carnosa, stricta; flores roseo-violacei et flavi," and gives as the native name "Cay-cay-nin = Planta Candelabrum."

15. I. **pygmaea**, *Hk. f.*, sp. nov.

Herba humilis, glaberrima, carnosa, caule simplice 3–4 cm. alto crasso erecto inferne nudo cicatricato. *Folia* 2–4 cm. longa, alterna, longe petiolata, crassa, late ovata v. ovato-rotundata, petiolo 3–5 cm. longo, nervis utrinque 4–5. *Inflorescentia* simpliciter pedicellata; pedicelli foliis breviores, basi ebracteati. *Flores* ad 2–5 cm. expansi, albi, apice violacei. *Sepala* 4: 2 exteriora late ovata, acuminata,

6–9 mm. longa, tenuiter membranacea, 6–7-nervia; 2 interiora microscopica, ovata, membranacea. *Vexillum* oblongo-obovatum, 13 mm. longum, apice bilobum, costa dorso infra medium gibbo obtuso instructa apice sinu minute rostellata. *Alae* 2 cm. longae; lobi basales falcatim obovati, incurvi, basi acuti; distales in laminam suborbicularem 12–15 mm. latam ad medium bifidam connati, lobulis simplicibus v. sinu excisis; auriculae dorsales minutae. Labelli limbus late cymbiformis, obtusus, 14 mm. longus, ore horizontale; calcar brevissimum, inflatum, incurvum v. simplex v. bilobum. *Filamenta* brevia, linearia; antherae in capitulum incurvum connatae. *Ovarium* lineare.

Indo-China; Hao Nho, juxta rivulos umbrosos vallis Thongsan, *Bon*, Herb. Miss. Tonquini occident., 1399 in Herb. Mus. Fribourg.

As in *I. Musyana* the microscopic inner sepals all but escape observation; if present I have failed to find them in *I. Boni* to which *I. pygmaea* is most nearly allied, differing, however, greatly in the foliage, spur of the lip and size of all parts. Father Bon describes the leaves as "crassa" and flowers as above.

16. **I. verrucifer**, *Hk. f.* in *Hook. Ic. Pl.* t. 2856.

Indo-China; Tonkin, Tan Kaun, convalle de Lankok, (sylvis Mont. Bavi) *Balansa*, 3880 in Herb. Mus. Paris et Kew.

17. **I. Ridleyi**, *Hk. f.* in *Rec. Bot. Surv. Ind.* iv. (1906) 56.

Fruticulus glaber, 3–6 dm. altus; caule erecto v. ascendente lignoso inferne ramoso, ramis gracilibus foliosis. *Folia* 3–6 cm. longa, alterna, petiolata, membranacea, ovata, acuta v. acuminata, crenulata setulis passim interjectis, basi cuneata, saepe biglandulosa, petiolo 1·5–2·5 cm. longo gracillimo, costa gracile, nervis utrinque 4–5; glandulae infrapetiolares 0. *Pedicelli* solitarii v. bini, 2·5–4 cm. longi; capillares, ima basi bracteati. *Flores* ad 2 cm. expansi, albi, fusco maculati. *Sepala* 2, ovato-rotundata v. orbicularia, cuspidatim acuminata, 6–7 mm. longa, 5–7-nervia. *Vexillum* cuneatim obovatum, retusum, costa dorso incrassata, basi ala crassa brevi aucta, apice mucronata. *Alae* 2·5 cm. longae; lobi basales longe stipitati, ovato-oblongi, acuti, recurvi; distales duplo majores, oblongae, connatae; auricula dorsalis minuta. *Labellum* hemisphericum v. cupulare, ore obtuso mucronato; calcar limbo brevius, robustum, incurvum. *Filamenta* subelongata, linearia; antherae parvae, obtusae. *Ovarium* fusiforme, obtusum. *Capsulae* parvae, ellipsoideae, 8–10 mm. longae, substipitatae, apice rostratae, polyspermae. *Semina* minuta, 1·5–2 mm longa, obovoidea, compressa, minute granulata v. tuberculata, castanea.

Peninsula Malayana; Perak, speluncis calcareis Gua Batu, *C. Curtis*, *Ridley*, 8278 in Herb. Kew., *Dr. Franz Kehding*.

I am indebted to Mr. Ridley for a good drawing of this species, by Mr. Hussain.

18. **I. cryptoneura**, *Hk. f.*, sp. nov.

Fruticulus glaberrimus, ramosus, ramis teretibus lignosis. *Folia* 5–10 cm. longa, alterna, petiolata, crassiuscula, ovato-lanceolata, acuminata, subserrulata, basi acuta nuda v. biglandulosa, in petiolum gracilem 2–7 cm. longum angustata, nervis utrinque 4–5 gracillimis aegre distinguendis; glandulae stipulares 0. *Pedicelli* solitarii, foliis multo breviores, ebracteati. *Flores* subglobosi,

ad 2 cm. expansi. *Sepala* 2, ovato-rotundata, cuspidata, ad 7 mm. longa, viridia, nervis reticulatis. *Vexillum* obovatum, 8 mm. longum, recurvum, costa crassa dorso basi gibbo instructa, apice cuspidata. *Alae* 1·5 cm. longae, stipitatae, ope loborum distalium connatae; lobus basalis falcatim incurvus; distalis brevior oblongus; auricula dorsalis parva, inflexa. *Labellum* breviter saccatum, basi calcare brevi incurvo instructum, ore 10 mm. diam., apice acuto. *Filamenta* brevissima, subulata; antherae parvae. *Ovarium* breve, ovoideum, acutum.

Peninsula Malayana; Perak, prope Ipoh, rupibus calcareis, *C. Curtis*, 3172, in Herb. Kew.

The specimens which I have seen of this are in a very bad state, but I have been aided in the description by a drawing lent me by Mr. Curtis, late Superintendent of the Botanic Gardens, Penang, of a specimen which flowered in that garden in June, 1896. The leaves are of a remarkably soft texture, apparently not succulent, in which the very delicate nerves are with difficulty detected. This peculiarity, so obvious in dried specimens, is well seen in Mr. Curtis' drawing of the living plant.

19. **I. Lanessani**, *Hk. f.* in *Hook. Ic. Pl.* t. 2855.

Indo-China; Cochin-China inferior: Pulo Condor, *Lanessan* in Herb. Mus. Paris.

20. **I. Spireana**, *Hk. f.* in *Hook. Ic. Pl.* t. 2859.

Indo-China; Tonkin, regione Laos, *Spire*, 246 in Herb. Mus. Paris.

21. **I. macrosepala**, *Hk. f.* in *Rec. Bot. Surv. Ind.* iv. (1906) 56.

Annua? fere glabra, caule erecto 6–7 dm. alto gracile basi simplice superne ramoso, ramis suberectis. *Folia* 5–10 cm. longa, alterna, longe petiolata, tenuiter membranacea, ovato-lanceolata, subcaudatim acuminata, obscure crenata setulis interjectis, juniora supra sparsim ciliolata, basi cuneata v. in petiolum gracilimum 2·5–4 cm. longum apice biglandulosum angustata, nervis utrinque 10–12. *Pedicelli* solitarii, filiformes, breves, basi nudi v. minute bracteati. *Flores* ad 2–5 cm. expansi. *Sepala* 2, orbicularia v. ovato-rotundata, ad 10 mm. diam., membranacea, labellum occludentia. *Vexillum* parvum, erectum, obovato-oblongum, costa dorso medio incrassata, apice mucronata. *Alae* ad 2 cm. longae; lobi basales stipitati, rotundati, stipite arcuato; distales ovato-oblongae, in laminam bifidam connatae. *Labelli* limbus parvus, scaphiformis, acutus, subtus mamillis 2 acutis parallelis auctus. *Filamenta* elongata, linearia; antherae didymae. *Ovarium* gracile, rectum, acuminatum. *Capsulae* fusiformes, 1·5–2 cm. longae, longe stipitatae et acute rostratae, oligospermae. *Semina* 3–4 mm. longa, minute granulata, fusco-atra.

Peninsula Malayana; Perak, rupibus calcareis prope Ipoh, *C. Curtis*, 3217. Siam Australis: Kasum, *Ridley in litt.* in Herb. Kew.

The above description is drawn up upon very imperfect materials. The large orbicular sepals, and didymous mamillae representing the spur of the lip distinguish it. No. 3217 represents elliptic-lanceolate leaves with petioles 10 cm. long.

22. **I. mirabilis**, *Hk. f.* in *Bot. Mag.* t. 7195.

Peninsula Malayana; Kedah, rupibus calcareis ins. Lankawi, *C. Curtis*, 1678; *W. Fox* in Herb. Kew.

23. I. Capusii, *Hk. f.* in *Hook. Ic. Pl.* t. 2864.

Indo-China; Sangir dak (? Songka ad ostia flum. Red river), *Capus* 2e Voy. in Herb. Mus. Paris.

24. I. oncidioides, *Ridley MSS.*

Herba fere glabra, caule simplice apicem versus folioso. *Folia* 10–12 cm. longa, alterna, submembrancea, petiolata, ovato- v. elliptico-lanceolata, acuminata, subserrulata, exsiccata subtus cuprea, basi in petiolum 2–3 cm. longum nudum v. pauciglandulosum angustata, nervis utrinque 8–10 gracillimis; glandulae stipulares 0. *Pedunculi* 6–10 cm. longi, 3–5-flori, pedicellique pubescentes v. glabrati; pedicelli 2–4 cm. longi, fructiferi elongati; bracteae 6–8 mm. longae, lineari-oblongae, acutae v. acuminatae, basin pedicellorum amplectentes, deciduae. *Alabastra* subglobosa, calcar limbo labelli brevius, incurvum. *Sepala* 2, oblonga, 9 mm. longa, mucronata, chartacea. *Filamenta* linearia, brevia; antherae connatae, obtusae. *Capsulae* 14 mm. longae, medio ellipsoideae, utrinque attenuatae, acute rostratae, polyspermae. *Semina* minuta, orbicularia, compressa, 2 mm. diam., atro-castanea, nitida.

Peninsula Malayana; Perak, Batang Padang, *L. Wray*, alt. 1,500 m., 1491 in Herb. Kew.

The specimens are in so imperfect a state that I long hesitated to describe and name them, but the species is so handsome and so well marked as the only peninsular one except *I. mirabilis* with peduncled inflorescence, that it cannot fail to be recognised. The leaves in a dried state are of a curious dull coppery-red colour beneath. Flowering specimens from Mr. Ridley have been received at Kew, but too late for description in this article.

25. I. Scortechinii, *Hk. f.* in *Rec. Bot. Surv. Ind.* iv. (1906) 56.

Herba glaberrima, succulenta, 2–3 dm. alta, caule erecto simplice robusto longe nudo laeve v. cicatricato, nunc inferne 2–3 cm. diam. *Folia* apicem versus caulis conferta, 12–16 cm. longa, alterna, longe petiolata, ovato-oblonga v. subrotundata, acuminata, serrata v. serrulata, basi cuneata, petiolo 1–2 cm. longo gracile, costa subtus robusta, nervis utrinque 8–14; glandulae stipulares 0. *Pedicelli* solitarii v. plures, pedunculo abbreviato sessiles, petiolis breviores, graciles, floriferi elongati. *Flores* ampli, albi, intus rubri. *Sepala* 4, 2 exteriora 10 mm. longa, late oblonga v. orbicularia, obtusa v. cuspidata, membranacea, viridia; interiora parva, ovato-lanceolata, acuminata. *Vexillum* obovato-oblongum v. cuneiforme, 2 cm. longum, apice rotundatum v. truncatum, costa dorso infra medium incrassata, apiculata. *Alae* 2·5–3 cm. longae; lobi basales ampli, rotundati, stipitati, stipite arcuato; distales oblongi in laminam latam bifidam connati. *Labelli* limbus late infundibularis, ore cuspidato, inferne in calcar breve robustum incurvum apice bifidum attenuatus. *Filamenta* 4–5 mm. longa, linearia; antherae majusculae, oblongae. *Ovarium* gracile, falcatum, longe rostratum. *Capsulae* 2–5 cm. longae, medio cylindraceae, longe stipitatae et graciliter rostratae, subtorulosae, oligospermae. *Semina* oblonga v. obovato-oblonga, 5 mm. longa, laevia, pallide fusca.

Peninsula Malayana: Perak, Sungit Siput, rupibus calcareis *C. Curtis*, 3115; Kwala Dipang, *Scortechini*, 1582, 1883, *Kingii mercenarii*, 7057 in Herb. Kew.

26. I. claviger, *Hk. f.* in *Hook. Ic. Pl.* t. 2863.

Indo-China; Tonkin, sylvis Mont. Bavi, convalle Lankok, *Balansa*, 3881 in Herb. Mus. Paris et Kew.

27. I. Balansae, *Hk. f.* in *Hook. Ic. Pl.* t. 2862.

Indo-China; Tonkin, sylvis Mont. Bavi, convalle Lankok, *Balansa*, 3880 in Herb. Mus. Paris et Kew.

II.—AUSTRALIAN PASTURE HERBS.

The following article on the economic value of Australian pasture herbs as stock feed was contributed by Mr. Fred. Turner, F.L.S., to the *Sydney Morning Herald* and was published in the issue of July 11th, 1907. As the article is of more than local interest and value it is reprinted here by kind permission of the proprietors of the *Herald*.

The Economic Value of the Australian Pasture Herbs.

Observant persons who have travelled much on the Australian continent cannot have failed to notice the large number of herbs, other than grasses and saltbushes, growing over immense tracts of country, and forming a good percentage of the indigenous herbage on many sheep and cattle stations. Owing to their varied character—for there are representatives of many different families of plants—these nutritious fodder herbs are a most important factor in making Australian native pastures rich feeding grounds for all kinds of stock. Moreover, the succulent stems and leaves of many of these plants assuage the thirst of the animals that eat them. Many of these herbs have long, strong roots, which penetrate deeply into the earth, and enable the plants to withstand a long period of dry weather, without any appreciable check to their growth. When not too closely fed over, they produce an abundance of seed which germinates readily under ordinary conditions, therefore they are fairly plentiful in many parts of the country. Most of them are herbaceous plants, and many are of upright habit, growing about one foot high, while several have prostrate stems, which lengthen considerably in good seasons.

Darling Clover (*Trigonella suavissima*).—This plant is sometimes called "Menindie clover," and "sweet-scented clover," but to the aborigines of the Darling country it is known as "Calomba." This clover-like plant, with fragrant stems and foliage, occurs in more or less abundance over an immense area in the interior. In favourable situations it is of perennial duration, and produces succulent stems three feet long or more. When growing on rich black soils that are subject to periodical inundations it produces a large amount of nutritious herbage, of which stock are particularly fond, and on which they fatten. Though this plant gives the greater yield of herbage on fertile land, it often grows on stony rises and on inferior country, and in such situations it is a valuable addition to the

pastures, as it provides good feed in late winter and early spring ere many other useful forage herbs begin to put forth much new growth. Sir Thomas Mitchell, exploring in the interior, *inter alia*, wrote of this plant, which he called "Australian shamrock"; "The perfume of this herb, its freshness and flavour, induced me to try it as a vegetable, and we found it to be delicious, tender as spinach, and to preserve a very green colour, when boiled." This opinion has since been confirmed by other persons who have used it in a similar way. The perfume of this plant is due to the presence of the chemical principle coumarine, which pervades all parts of the plant. The Darling clover is one of the many indigenous herbs that would repay systematic cultivation in the interior, where exotic clovers would not succeed, owing to the aridity and great heat in summer. If cut when in flower, and properly cured, it makes good hay, and would probably pay to be grown for ensilage.

Crowfoot.—Two important herbs are called "crowfoot," viz., *Erodium cygnorum* and *Geranium dissectum*. The former is an annual or biennial plant, with stems usually lying flat upon the ground, and three feet or more long. It has large, deeply-lobed leaves and blue flowers, and when in bloom is a conspicuous object amongst the surrounding vegetation. In spring and early summer it often forms 60 per cent. of the herbage on some areas. This plant is widely distributed over the Australian continent, and grows as frequently on sandy as on more fertile country. It is a superior pasture herb, and whilst young affords rich, succulent herbage, of which herbivora of all descriptions are remarkably fond. Horses will often leave good feed to browse upon it. All stockowners speak very highly of this herb, and regard it in a young state as an excellent forage plant. Under cultivation it produces a large amount of herbage, and if cut when in flower not only makes valuable green food, but, when properly cured, capital hay. This "crowfoot" when in fruit is disliked by the sheep-owner, on account of its sharp-pointed seed lobes, which not only attach themselves firmly to the wool, but sometimes penetrate the skin of the animals.

The *Geranium* is a spreading perennial plant with a thick, carrot-like root, deeply-divided leaves, and usually pink flowers. It is fairly abundant in many parts of the interior, and withstands a long period of dry weather without its growth being seriously checked. In times of drought the roots remain dormant, but after a good fall of rain put forth stems and leaves in abundance. All kinds of stock are partial to this plant, which is considered nutritious. Sheep are very fond of the carrot-like roots, and often scrape away the soil with their hoofs in order to get at them. At one time the roots formed an important article of food for the aborigines, who used to roast them on ashes. The seed lobes of this plant have no sharp points like those of the one previously referred to.

Hogweed, or Pigweed (*Boerhaavia diffusa*).—This is a perennial plant with spreading stems growing sometimes several feet long, and often forming a dense mass of herbage. It occurs over large tracts of both good and inferior country in the interior, and in many places is fairly plentiful. Its rather thick, fleshy, long roots, which at one time formed an article of food for the aborigines, are said to

have vermifugal properties. This plant withstands a long period of dry weather, and its green leaves and small pink flowers may often be seen when the surrounding vegetation is dried up for want of rain. It is a good forage plant, and both sheep and cattle are very partial to it. As it begins to grow very early in the season, before many other useful kinds of herbage put forth new leaves, it is a desirable plant to encourage in the pastures. The "hogweed" frequently grows in juxtaposition to members of the mallow family, particularly species of the genera *Lavatera*, *Malvastrum*, and *Sida*, several of which whilst young are good forage plants. In that state sheep and cattle are very fond of them, for both their stems and leaves are succulent and mucilaginous.

Mustard.—Many cruciferous piants, notably species of the genera *Blennodia* and *Lepidium* are popularly known by the name of mustard, with varying prefixes, or cress, on account of the pungent flavour that pervades most of them. Towards the end of winter or early spring the bright flowers of a number of species are a conspicuous feature on many of the inland plains. Although the prevailing colour of the flowers is yellow, it varies in intensity, and there are several species which have white, purple, pink, or lilac blooms. Most of these herbs average about 1 foot in height, and are very good forage plants, which most kinds of stock eat with avidity, their more or less pungent flavour contributing to their palatability. Dairy cows giving milk, however, should not be allowed to graze in pastures where these plants grow abundantly, for when eaten freely they flavour both milk and butter, often to such an extent as to render them unfit for domestic use. All these plants, when not too closely fed over, produce an abundance of seed, which germinates readily after a good rainfall at almost any season of the year, and the resulting growth is a quantity of succulent herbage.

Nardoo (*Marsilea Drummondii*).—This is a plant of historical interest, inasmuch as its fruit at one time formed, after preparation, an important article of food for the aborigines, and is still used by them in the far interior, and the unfortunate explorers Burke and Wills tried to subsist on it, although, judging from Wills' journal, it does not appear to have afforded them much nourishment. This dwarf, clover-like plant, occurs in the interior of all the Australian States, generally on the margins of swamps or where water collects in shallow pools after rain. When the water subsides the young plants grow rapidly in the mud, and eventually cover the ground with dense vegetation, reminding one of cultivated clover. All kinds of stock are extremely fond of this plant, which is regarded as nutritious feed.

Native carrot (*Daucus brachiatus*).—An annual herb with herbaceous stems, often growing from 2 feet to 3 feet high, but generally not so tall, has elegant, divided leaves, small flowers arranged in clusters, and burr-like fruits, which are, when ripe, called "carrot burrs" by stockmen. This plant is widely distributed over the interior, growing on both rich and sandy country, and in spring and early summer forms a large percentage of the herbage on extensive areas. In a young state the "native carrot" is an exceedingly good forage plant, to which most kinds of pasture animals are partial,

particularly sheep, which thrive on it. This herb is closely allied to the cultivated carrot, and its leaves have a pronounced taste like those of that plant, and, therefore, cows giving milk should not be allowed to graze in pastures where it grows prolifically, or a "flavour" may be imparted to both milk and butter. The "native carrot" improves much under cultivation, and yields a larger bulk of herbage than is usually seen under the best natural conditions. This plant produces an abundance of seed, which germinates readily after rain, and to these circumstances may be attributed its extensive growth in the interior. Its seeds, "carrot burrs," covered with hooked bristles, are very much disliked by the sheep-owner, because they adhere to the fleece with great tenacity, and, therefore, are troublesome to get out of the wool. The allied genus *Apium* consists of two species, popularly called "native parsley," which are eaten and relished by stock.

Native lucerne (*Psoralea tenax*).—It is a perennial plant of the pea-flowering family, with slender branching stems, growing from 1 foot to 2 feet high or more, divided leaves and small, usually blue, flowers disposed on rather long stalks. It has long, very strong roots, which penetrate the earth for from 5 feet to 7 feet or more, and thus enable the plant to endure a phenomenal amount of dry weather without its growth being checked to any serious extent. The native lucerne grows over a great part of New South Wales and Queensland, and many pastoralists regard it as an excellent forage plant. Most herbivora are fond of its succulent stems and foliage, and seem to do well on them.

Several species of the allied genus *Swainsona*, which are widely distributed over the continent, are very good forage plants, stock eating them readily and thriving on them. Two species (*S. galegifolia* and *S. Greyana*), however, popularly known as cranky pea, Darling pea, and indigo, are suspected poison plants, but many conflicting statements have been made regarding them. When stock, particularly sheep, eat no other plants for a time, serious consequences frequently follow, but when they eat them with plenty of other herbs and grass ill-effects have rarely been noticed. There are other leguminous or pea-flowering herbs belonging to different genera, and occurring in many parts of Australia, that are very good forage plants, and are largely eaten by all herbivora.

Native plantain, or wild sago, (*Plantago varia*).—A perennial herb, with a long root, and leaves varying from less than 6 inches to 1 foot long. It is found over a great part of Australia, and on large areas in the interior it is fairly abundant. This plant grows on both rich and inferior country, but on the former yields a larger amount of herbage. Its succulent, mucilaginous leaves are much relished by sheep and dairy cows fed on the plant are said to yield plenty of milk. Horses, however, eat the plant but sparingly. When not too closely fed over, this plant produces an abundance of seed upon which some kinds of birds feed. Its seeds are sometimes gathered by the settlers in the back country, who use them as a substitute for commercial sago, hence one of its common names. There are six species and several varieties of the genus *Plantago* indigenous to Australia, three of them occurring in the coldest parts, with much the same properties as the one referred to.

Parakeelya (*Calandrinia balonensis*).—Is the aboriginal name of a plant widely distributed in the drier and hotter parts of the continent. This is an erect-growing plant of from 6 inches to 1 foot high, or more; the slender branching stems of which are clothed with thick, fleshy leaves 1 inch to 2 inches long. Its rather large purple flowers are disposed on terminal stalks. When figuring and describing, under instructions from the Government of Western Australia, the plants of economic value that compose the pasture herbage of the western part of the continent, my attention was drawn to this plant with very succulent leaves as being one of the best to assuage the thirst of stock that eat it. It is now well known that Parakeelya affords both feed and moisture to herbivora in waterless country, and there are authentic records of stock having travelled nearly 300 miles without a drink of water over country where this plant was growing. Some allied species have similar properties. The Purslane, or Munyeroo, of the aborigines (*Portulaca oleracea*), is an annual, belonging to the same family as the Parakeelya, with succulent stems and leaves which are much relished by most pasture animals, and which in the interior often afford them both feed and moisture. This plant produces numerous, small, black seeds, which are collected and used as an article of food by the aborigines in the back country. Its stems and leaves are often cooked and eaten.

Warrigal cabbage (*Tetragonia expansa*).—This is both an excellent table vegetable, when properly cooked, and a very good forage plant. It is a prostrate-growing annual, with stems, which sometimes extend several feet, clothed with succulent leaves from 2 inches to 4 inches long. It is widely distributed, and common in many parts of the interior on both good and inferior country, and it withstands an extraordinary amount of dry weather. Sheep and cattle are particularly fond of its succulent stems and leaves, which not only provide good feed, but assuage the thirst of the animals that eat them—a great consideration in dry seasons in the interior. Other members of the same family have similar characteristics.

The above brief descriptions of some of the most prominent pasture herbs indigenous to Australia will give a good idea of the great importance of these plants in the pastures, and the necessity of systematically conserving them in order to keep the grazing areas in a suitable condition for feeding stock.

FRED. TURNER.

III.—PLANT DISEASES.—IX. DRY SCAB OF POTATOES.

(*Spondylocladium atrovirens*, Harz.)

G. MASSEE.

This disease is caused by a parasitic fungus named *Spondylocladium atrovirens*, Harz. It has been known on the Continent since 1871, and under the name of *Phellomyces sclerotiophorus*, Frank, is stated by Professor Johnson to be the cause of serious trouble to the potato crop in Ireland. It also occurs in the United States.

Within the past few weeks three samples of diseased potatoes were submitted to Kew for examination. Two of these came from different parts of Scotland, the other from England. The disease in each instance proved to be "Dry Scab," which up to the present was believed to be absent from Britain.

The injury is confined to the tubers, and no indication of its presence is suggested by the foliage, which remains unaffected. It causes disfigurement of the surface of the tuber, followed by local patches of a dry rot. It presence is revealed by the occurrence of blackish-olive or blackish-violet patches, which soon become depressed below the general surface of the tuber, due to the drying and breaking up of the tissue. Very frequently only one or two such sunken areas, which vary from half an inch to an inch across, are present on a tuber. As a rule, numerous very minute black sclerotia are present in the epidermal cells, or on the surface of the tuber, in the region of the sunken areas. In some instances numerous minute sclerotia, scattered over the surface of the tuber, are alone present. During a certain period in the development of the disease, the depressed patches and the sclerotia are covered with the fruit of the fungus, which under a pocket-lens resembles myriads of very minute, upright black bristles. As the dark coloured mycelium permeates the tuber, the tissue becomes dry and somewhat powdery, and crumbles away leaving a shallow cavity. Those portions of the skin bearing sclerotia also readily peel off in flakes, which remain in the soil and endanger future crops. If a tuber bearing sclerotia or sunken areas is placed in a damp, warm place, the fruit of the fungus is produced in abundance within a few days. Such fruit is not confined to the obviously diseased portions, but occurs scattered over the entire surface of the tuber, proving that mycelium migrates from the primary diseased areas, and that portions of the tuber apparently free from disease are in reality infected; consequently it is not advisable to use as "sets" any tubers showing signs of the disease, as is too frequently done, after the obviously diseased portion has been cut away.

The sclerotia and mycelium, in the absence of fruit, were described by Frank under the name *Phellomyces sclerotiophorus.*

1. Tuber showing diseased depressed areas and minute sclerotia
2. *Spondylocladium atrovirens* × 300.
3. A sclerotium on the surface of a tuber × 50.

At a later date Appel and Laubert succeeded in obtaining the fruit of *Spondylocladium atrovirens*, Harz, from these sclerotia, and consequently *Phellomyces* disappears as a genus. This proof has been verified at Kew.

Failure has attended attempts to infect roots of carrot, parsnip, and turnips with *Spondylocladium*, and it is just possible that this parasite may be confined to potatoes.

The habit of the fungus is shown in the accompanying illustration. The conidiophores are coloured, 300–400 μ high. Conidia 30–50 × 6–9 μ.

The following extract from a letter received from an Agricultural College, along with one of the diseased lots of potatoes, proves that the disease is not quite new to this country, and also proves that tubers known to be diseased are sometimes planted :—

"They were grown on moss land . . . which had been uncropped for five years, and was manured with leaf mould and basic slag. The 'seed' potatoes were similarly affected."

Bibliography.

Appel and Laubert ; Ber. deutsch. Bot. Ges., 23, p. 218 (1905).
Clinton ; State Conn. Exp. Sta. Rep., 1907–08.
Frank ; Ber. deutsch. Bot. Ges., 16, p. 280 (1898).
Harz ; Einige Neue Hyphomyceten, p. 129, pl. 31 (1871).
Johnson ; Econom. Proc. Roy. Soc. Dublin, 1, p. 161 (1903).

IV.—THE SECTION OMPHACARPUS OF GREWIA IN AFRICA.

T. A. Sprague.

The genus *Omphacarpus* was founded by Korthals about 1839–1842 (Verh. Nat. Gesch. Bot. p. 192, t. 42) to receive two tiliaceous shrubs, both of them natives of Borneo. Though establishing it as a distinct genus on account of the nature of the fruit—a 1-celled 1-seeded drupe with fibrous mesocarp and coriaceous endocarp—Korthals clearly recognised its close relationship with *Grewia* ; indeed, he admitted that it might be regarded as a section of that genus taken in a wide sense, and might then be placed alongside the section *Microcos*. His two species were *Omphacarpus opacus*, with undivided stipules and glabrous fruits, and *O. hirsutus*, distinguished by tripartite stipules and hirsute fruits.

In 1849 Hooker fil. (Niger Fl. p. 237) added a third species, *O. africanus*, from Sierra Leone. Ten years later Miquel (Fl. Ned. Ind., i. part 2, p. 204) reduced *Omphacarpus* to the status of a section of *Grewia*, and as such it has been regarded by subsequent authors.

Masters in 1868 (Fl. Trop. Afr., i. p. 243) added two new African species to the section, and described a third, *G. coriacea*, which he supposed to be exinvolucrate, and therefore excluded from

it. It is now known, however, to possess the involucre and fruit characteristic of the section. Six years later he described (Fl. Brit. Ind., i., p. 391) four new species from the Malay Peninsula, and a fifth, previously published by Kurz, from the Andamans.

Finally, King, in 1891 (Materials, vol. i. p. 218), referred *G. Miqueliana*, Kurz, to the section, and described an additional species, from Perak. The excellent key and descriptions given by King make it quite evident that the separation of *Omphacarpus* as a genus, or even as a subgenus, cannot be upheld, as two or three pyrenes are found in some of the species, and the pyrenes may vary from 1-celled to 3-celled (*G. laurifolia*).

Turning now to the African species described since 1891:—*G. barombiensis*, K. Schum., published in 1892, as belonging to section *Microcos*; *G. calymmatosepala*, K. Schum., described in 1903, as an ally of *barombiensis*; and *G. ugandensis*, Sprague, published in 1906, appear to be valid. The remaining five species, however, have had to be reduced.

Details of the number of cells in the ovary, and of the ovules in each cell are not available for most of the Asiatic species. In the African species, however, I have invariably found the ovary to be 3-celled, except in *G. pinnatifida*, where it is 2-celled; and the ovules are 4 in each cell, except in *G. coriacea*, which has 2 per cell.

A short diagnosis of the section, applicable, however, only to the African species, may be found useful:—*Cymae* paniculatae cymulis involucratis. *Ovarium* 3-loculare, rarius 2-loculare; ovula 4 pro loculo, rarius 2. *Drupa* pyriformis, 1-locularis, monosperma, mesocarpio fibroso.

Clavis specierum.

Stipulae integrae vel laciniatae; inflorescentiae et nervi foliorum subtus pilis simplicibus non hirsuti.

Folia utrinque glabra, maxima (14–27 cm longa); ovarii loculi 2-ovulati ... ... 1. *coriacea*.

Folia subtus ± induta, minora; ovarii loculi 4-ovulati.

Folia subtus pilis stellatis inspersis puberula.

Stipulae laciniatae (species occidentales).

Folia exsiccando utrinque brunnea; inflorescentiae brunneae, elongatae, multiflorae ramis ascendentibus ... ... 2. *africana*.

Folia exsiccando subtus vel utrinque viridia; inflorescentiae fulvae, graciliores, laxiusculae ramis patentibus vel patulis ... 3. *barombiensis*.

Stipulae integrae (species orientalis) 4. *calymmatosepala*.

Folia subtus indumento minuto continuo.

Folia subtus griseo-vel albido-tomentella, opaca.

Bracteae pedicellis breviores... 5. *malacocarpa*.

Bracteae pedicellis multo longiores, alabastra subaequantes ... ... 6. *Drummondiana*.

Folia subtus pallide isabellina, indumento subtili sub lente argenteo-nitidulo pilis majoribus brunneis inspersis ... ... 7. *ugandensis*.

Stipulae pinnatifidae; inflorescentiae et nervi foliorum subtus pilis simplicibus hirsuti.

Folia exsiccando pallide brunnea vel viridia; nervi laterales utrinque 11–15; stipulae non furfuraceae; ovarium 2-loculare ... ... 8. *pinnatifida.*

Folia exsiccando intense brunnea; nervi laterales utrinque 6–8; stipulae furfuraceae; ovarium 3-loculare 9. *oligoneura.*

1. **Grewia coriacea,** Mast. in Fl. Trop. Afr., i. 1868, p. 252; De Wild. in Ann. Mus. Congo, sér. 5, ii. 1908, p. 298.

Masters described this species as having exinvolucrate cymules and a 2–3–∞-celled ovary with numerous ovules attached in a double row to the inner angle of each cell. The cymules, however, are involucrate, as in the other species of the section, and the ovary appears to be constantly 3-celled with 2 ovules only in each cell. The cells, which are comparatively small, are situated in the lower half of the fleshy ovary, and have very thin septa, whilst the outer wall of the ovary is relatively very thick; consequently, the dissection of the ovary is unusually difficult.

The fruits have not hitherto been described. They are brown or buff coloured in the dried state, 2·5–3 cm. long, and glabrous.

Cameroons. Efulen, *Bates*, 400! Bipinde, *Zenker*, 1554! 2616! 2623! 2625! 3009! 3197! 3329! 3454! Spanish Gaboon. Kongui River, *Mann*, 1695! Congo Free State. Eala, *Marc Laurent*, 1192; Injolo, *Marc Laurent*, 1850, 1857, 2050; Impolo, *Huyghe & Ledoux*, 37; Madibi, *A. Sapin.*

Native names in the Congo Free State:—Bofumbo (Bangala), Binganganan (Kwilu).

2. **G. africana,** Mast. in Fl. Trop. Afr., i. 1868, p. 253.

Omphacarpus africanus, Hook. f. in Niger Fl. p. 237 (1849).

Grewia brunnea, K. Schum. in Engl. Jahrb., xxxiii. 1903, p. 301.

Sierra Leone. *Don*! Cameroons. Yaunde Station, *Zenker*, 603! 672. (671! in herb. Kew).

Don's specimen is in fruit, whilst Zenker's are in flower, but the foliage and inflorescence match so exactly that I have no hesitation in reducing *G. brunnea.*

Christian Smith's Congo specimen, quoted by Masters under *G. africana*, is certainly distinct, and probably represents an undescribed species. The indumentum of the lower surface of the leaves is very different.

3. **G. barombiensis,** K. Schum. in Engl. Jahrb., xv. 1892, p. 124; De Wild. in Ann. Mus. Congo, sér. 5, ii. 1908, p. 298.

G. Laurentii, De Wild. Miss. Emile Laurent, p. 399, t. 125 (1907), e descr. et icone.

The excellent figure and description of *G. Laurentii* leave no doubt as to its being identical with *G. barombiensis.*

Schumann has described the ovary of *G. barombiensis* as 2-celled; I have found it to be 3-celled, however, in each of five flowers examined, two of which were from the type number.

Lagos. Forest clearings at Ajilite, *Millen*, 171! Cameroons. Barombi Station, *Preuss*, 385! Bipinde, *Zenker*, 1039! 1937b! 2400! 3678! Lower Congo. *Gillet.*

4. **G. calymmatosepala,** K. Schum. in Engl. Jahrb., xxxiii. 1903 p. 302.

German East Africa. Usambara, near N'derema, 800 m., *Scheffler*, 90.

5. **G. malacocarpa**, Mast. in Fl. Trop. Afr., i. 1868, p. 253 ; Stapf in Johnston, Liberia, ii. p. 583.

G. dependens, K. Schum. in Engl. Jahrb., xxxiii. 1903, p. 304.

G. malacocarpoides, De Wild. in Ann. Mus. Congo, sér. 5, vol. ii. 1908, p. 298, e descr.

The type specimen of *G. malacocarpa* bore fruit but no flowers, and this no doubt led to Schumann's describing flowering material from Togoland as a new species. Schumann stated that the close grey indumentum on the lower surface of the leaves distinguished *G. dependens* from all the other species with paniculate inflorescence, but this indumentum is characteristic of *G. malacocarpa*.

The differences adduced by De Wildeman as distinguishing *G. malacocarpoides* from *G. malacocarpa* lie in the colour of the indumentum, the shape and nervation of the leaves, and the absence of glabrous acarodomatia in *G. malacocarpoides*. The series of specimens in the Kew Herbarium exhibits similar differences in the leaves, but after dissecting side by side flowers of Liberian, Togoland, Lagos and Cameroons specimens I am unable to detect any differences in them which would, in my opinion, justify segregation. The glabrous acarodomatia are only evident on the leaves of Bate's No. 441, but they are present on the other specimens, masked, however, by the tufts of hairs so frequently found on the lower surface of leaves in the axils of the lateral nerves. The indumentum thus appears continuous, as described for *G. malacocarpoides*. The pedicels of *G. malacocarpoides*, however, are from description only 3 mm. long, as against 4–6 mm. in *G. malacocarpa* ; and seem to be little longer, therefore, than the bracts.

Liberia. Near Kakatown, *Whyte !* Sino basin, *Whyte !* Togoland. On the Day River at Cwegbe, *Baumann*, 441 ! Western Lagos. In the interior, *Rowland !* Northern Nigeria. Confluence of the Niger and Benue Rivers, *Barter*, 447 ! Cameroons. Efulen, *Bates*, 414 ! Congo Free State. Eala, *L. Pynaert*, 590 ; Bomaneh, *Marc Laurent*, 1861, 1864.

6. **G. Drummondiana**, *Sprague*, sp. nov.

Frutex scandens. *Folia* ovata vel ovato-oblonga, apice acutiuscule acuminata, basi rotundata, 7–12 cm. longa, 3–5·5 cm. lata, supra exsiccando viridia nervis stellato-puberulis ceterum glabrescentia, subtus sordide griseo-tomentella nervis et venulis prominentibus ; nervi laterales utrinque 4–5 ; petioli 8 mm. longi, tomentelli ; stipulae subulatae, circiter 3 mm. longae. *Cymae* brunneo-tomentellae, divaricatae. *Bracteae* 5–6 mm. longae, alabastra aequantes, profunde bipartitae vel tripartitae lobis linearibus vel subspathulatis. *Pedicelli* 2–3 mm. longi. *Ovarium* 3-loculare, loculis 4-ovulatis.

Gaboon. Como River, 75 miles from Gaboon, *Bates*, 459 !

In habit and foliage *G. Drummondiana* resembles *G. malacocarpa* ; in the large bracts and coarse indumentum of the inflorescence it approaches *G. barombiensis*. Named in compliment to Mr. J. R. Drummond, who has freely afforded the writer the benefit of his extensive knowledge of the genus *Grewia*.

7. **G. ugandensis**, Sprague in Journ. Linn. Soc., xxxvii., 1906, p. 503.

Uganda. Unyoro, *Dawe*, 918!

8. **G. pinnatifida**, Mast. in Fl. Trop. Afr., i., 1868, p. 253; De Wild. Miss. E. Laurent, p. 399; Ann. Mus. Congo, sér. 5, ii., p. 299.

G. crinita, K. Schum. in Engl. Jahrb., xxxiii., 1903, p. 303.

Gaboon. Sierra del Crystal, *Mann*, 1738! Sibange Farm, *Soyaux*, 161! 221! Congo Free State. Near Bolombo, *Laurent*; Romée, *Marc Laurent*, 1059; Nala, *Seret*, 801; Yambuya, *J. Solheid*, 61.

I have not seen any specimens from the Congo Free State, but, judging from the geographical position, the determinations are presumably correct.

9. **G. oligoneura**, *Sprague*, sp. nov.

Arbor 7·5–9 m. alta. *Ramuli* primum hirsuti, demum glabrescentes. *Folia* oblanceolato-oblonga, apice longe acute acuminata, in basin obtuse et inaequaliter angustata, 11–19 cm. longa, 3·5–5·5 cm. lata, supra nervis puberulis vel hirsutis ceterum glabra, subtus nervis et venulis prominentibus puberulis nervo medio hirsuto; petioli 5–7 mm. longi, hirsuti, furfuracei; stipulae usque ad 1 cm. longae, hirsutulae, furfuraceae, laciniis utrinque 3–5 usque ad 6 mm. longis. *Inflorescentiae* juveniles 7–8 cm. longae, laxiusculae ramis ascendentibus.—*G. pinnatifida*, K. Schum. in Engl. Jahrb., xxxiii., 1903, p. 304, in obs., non Mast.

Cameroons. Yaunde Station, *Zenker*, 683! Fernando Po. *Mann*, 210!

Closely allied to *G. pinnatifida*, but easily distinguished by the characters given in the key, and also by the laxer inflorescence with ascending branches. Schumann, who had not seen the type of *G. pinnatifida*, took the present species for it, and described Gaboon specimens of the true *pinnatifida* as a new species *crinita*.

V.—MISCELLANEOUS NOTES.

Mr. Archibald Clarence Miles, a member of the gardening staff of the Royal Botanic Gardens, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, a Curator of Botanic Stations in the Agricultural Department of the Gold Coast.

Mr. W. C. Worsdell has been appointed deputy Professor of Botany at the South African College, Cape Town, South Africa, in the room of Professor H. H. W. Pearson during his travels in Angola and elsewhere in the present year.

Retirement of Mr. W. B. Hemsley.—The official services of this well-known member of the Kew staff came to an end, on his reaching the age limit, on 28th December, 1908. Mr. William Botting Hemsley, who had as a boy evinced strong botanical tastes, entered Kew as a young gardener in 1860, when 16 years of age. After he had spent some time in that capacity his remarkable botanical aptitude led to his employment in the Herbarium, where

his work attracted the attention of the late Mr. Bentham, and is mentioned in the preface (vol. i. p. 8) to that author's *Flora Australiensis*. On the occurrence of a vacancy in 1865 Mr. Hemsley was appointed Herbarium Clerk, succeeding Mr. Alexander Smith.

A complete breakdown in health compelled Mr. Hemsley to relinquish this post in 1867, but on his partial recovery he returned to Kew in 1874 as an independent worker, and in 1883, his health having become completely restored, he re-entered the service of Kew as Assistant for India. In 1890 Mr. Hemsley was appointed a Principal Assistant in the Herbarium, and in 1899 he succeeded Mr. J. G. Baker as Keeper of the Herbarium and Library.

In certifying that Mr. Hemsley has discharged his official duties with diligence and fidelity and to their entire satisfaction, the Board of Agriculture and Fisheries have further placed on record "their appreciation of the very valuable services which Mr. Hemsley has rendered to the Royal Botanic Gardens at Kew since he became associated with that institution, now nearly 49 years ago. His constant courtesy and kindness to his colleagues, the ability which he has brought to the discharge of his duties, and his high scientific attainments have all contributed materially to the maintenance and development of the distinguished reputation which Kew enjoys both at home and abroad. The Board greatly regret that Mr. Hemsley's retirement has become necessary, but they trust that he will be spared for many years to come to continue his labours on behalf of that science with which his name is so honourably associated and towards the prosecution of which he has done so much."

On December 29th the members of the Herbarium staff handed to Mr. Hemsley the following farewell address:—"We, who have been associated with you in the Herbarium, feel that we should not allow the occasion of your retirement from the Keepership to pass without expressing our cordial goodwill and friendliness towards you. We beg to assure you of our full appreciation of the work you have accomplished and our sincere wish that you may long enjoy health to pursue those studies that have been so congenial to you in the past, and by which Botany has gained so much."

The time which has been at Mr. Hemsley's own disposal has been as fully occupied as that given by him to official duties, in valuable contributions to botanical knowledge. Among such contributions may be mentioned a share in the preparation of the *Flora of Tropical Africa*; a *Flora of Sussex*; a *Flora of Mexico*, in Salvin and Godman's "Biologia Centrali-Americana," *Insular Floras*, in the "Challenger" Reports; and works on the Flora of Afghanistan, conjointly with Dr. Aitchison, on the Flora of China, and on the Flora of Burma, conjointly with Sir H. Collett.

One of Mr. Hemsley's earliest distinctions was a first prize for Botany, awarded by the Society of Arts in 1863. He was elected an Associate of the Linnean Society in 1875, and became a Fellow in 1896. In 1889 he was elected a Fellow of the Royal Society.

The President of the Board of Agriculture and Fisheries has been pleased to appoint Dr. O. Stapf, F.R.S., F.L.S., to succeed Mr. Hemsley as Keeper of the Herbarium and Library, and to appoint Mr. C. H. Wright, A.L.S., to perform the duties hitherto carried out by Dr. Stapf.

Alexander Whyte, whose death at the age of 75 occurred at High Barnet on 21st December, 1908, was a younger son of the Rev. A. Whyte, M.A., minister of Fettercairn, Kincardineshire. Mr. Whyte was born at Fettercairn on 5th March, 1834, and was educated at the Parish School there, under Mr. (afterwards Dr.) Inglis and, after 1846, under the Rev. J. Law. He entered the University of Aberdeen in 1850, reading during vacations with Mr. (now Dr.) Cameron. During his university career he proved a proficient classical scholar and took a distinguished place in the classes of Natural History and Botany. He left for the West Indies, where his family had interests, before completing his university curriculum, and for the same reason subsequently went to Ceylon. During his residence in that island he continued to take an active interest in natural science, more particularly in Zoology, making considerable collections and latterly embarking in business in Colombo as a Naturalist. He was elected a Fellow of the Zoological Society in 1877.

Whyte returned to England in October, 1890, and in March, 1891, at the age of 57, he became attached to the staff which accompanied Mr. (now Sir) H. H. Johnston on his departure to take up the duties of Commissioner in British Central Africa.

In 1894 he became a Fellow of the Linnean Society and in the same year was made an Honorary Fellow of the Zoological Society "for services rendered to the Society," which on 16th June, 1897, awarded him their Silver Medal "in acknowledgment of valuable services rendered to Zoological Science by his researches in British Central Africa."

In 1898 Whyte's services were transferred to the Uganda Administration, and in 1902 he went as Director of Agriculture to British East Africa. He retired from Government service in 1903, but in 1904–5 he made journeys in Liberia on behalf of a company which had been granted concessions by the Government of that State.

Endowed with a robust constitution, good powers of observation and a capacity for taking pains, Whyte was an excellent collector, and his specimens illustrating the Botany of those parts of Africa in which he had travelled have proved, like his zoological contributions, to be of much interest and to include a considerable percentage of species previously unknown to science. His name in this connection is commemorated in *Widdringtonia Whytei*, the Mlanji Cypress, notices of which have appeared in this work (*K.B.* 1895, pp. 158, 199; 1896, p. 216).

Visitors during 1908.—The number of persons who visited the Royal Botanic Gardens during the year 1908 was 2,710,220. These figures shew a decrease of 252,494 visitors over the year 1907 when the number of visitors was the largest yet recorded.

During the last ten years (1898–1907) 16,428,084 persons have visited the Gardens, giving an average of 1,642,808. The total number on Sundays was 1,321,584 and on week-days 1,388,836. The number of visitors on Sundays is the largest on record, being in excess of that for 1907 by 52,883. The increase is probably very largely due to the great number of French visitors during the summer. The total number on week-days was 1,388,836, the corresponding number for 1907, 1,694,213. The maximum attendance on any one day was 98,388 on August 3rd. The smallest number on any one day was 68 on January 21st. The greatest number on a Sunday was 70,904 on July 26th and is a record number for a Sunday, shewing an excess of 5,990 visitors over the figures for 1907. The smallest number on a Sunday was 1,032 on December 6th.

The detailed monthly returns are given below :—

January	34,807
February	55,896
March	76,015
April	200,203
May	482,732
June	462,137
July	340,286
August	493,694
September	257,515
October	209,988
November	88,947
December	28,000
	2,710,220

Museums.—During the year 1908, much has been done to improve the collections in Museums I. and II., large specimens have been reduced to a minimum size to prevent over-crowding, others have been transferred to the carpological collection of the Herbarium, and much material deteriorated by age, has been replaced by fresh specimens. It was found necessary to lay new linoleum on the top floor of Museum No. I. and to provide additional accommodation for books in the Museum library.

A collection of rubbers of historical interest, together with living plants, and herbarium specimens of rubber-yielding plants, was selected and exhibited at the International Rubber Exhibition, held at Olympia, and in this connection it may be recorded that the Director of the Royal Gardens and the Keeper of the Museums were upon the Advisory Committee of the Exhibition.

An exhibit was also prepared for the Forestry section of the Bath and West and Southern Counties Show, held at Dorchester. This exhibit consisted chiefly of material from the Kew Arboretum to illustrate good and bad methods of pruning and diseases ; herbarium specimens and photographs of forest trees were also sent in addition to various specimens selected from the Museums.

During the year there were 175 contributors to the Museums including various representatives of the different sections of the

Franco-British Exhibition, the International Rubber Exhibition, and the Hungarian Exhibition. From these sources the bulk of the presentations have been received. From several exhibitors at the Dorchester Show many specimens of home-grown timber, photographs, and other material interesting in forestry have been received. These are in course of preparation as museum specimens. Many other donations of more or less interest have been recorded in the numbers of the *Bulletin* issued during the year.

All available duplicates, fully labelled, have been distributed to 48 recipients, including the Imperial College of Science and Technology, South Kensington, the Botany School, Cambridge, and Mr. A. Henry, Reader in Forestry, Cambridge University.

Much time has necessarily been devoted to supplying information upon and in determining specimens of economic products sent for name by numerous correspondents, including the Director of the Imperial Institute, the Curator of the Museum of the Pharmaceutical Society, the Director of the Colonial Museum, Haarlem, the Secretary of the London Chamber of Commerce, the Editor of the India Rubber Journal and others. In nearly 270 of these enquiries the products have been determined, and in most instances full references have been given to the literature bearing upon the subject. For several correspondents connected with Botanical Departments in the Colonies commercial opinions and advice upon products submitted have been obtained from experts.

Much work remains to be done in dealing with the large quantity of products received from the exhibitions. Other work in hand consists of the preparation of a new edition of the Guide to the Timber Museum and a list of the Useful Plants of Nigeria.

Additions to the Herbarium during 1908.—About 11,500 sheets were presented or received in exchange, while over 11,700 sheets were purchased. The principal collections are enumerated below. Except where otherwise stated or implied, the collections purchased are named, and those presented are unnamed or only partially named.

Various Parts of the World. *Presented*:—French Colonies, named, by the Natural History Museum, Paris; named Gossypium, by Sir G. Watt, C.I.E.; named Aconitum, by the Royal Botanic Garden, Calcutta; named Bamboos, by Mr. J. H. de Lehaie; various named plants, by the Botanical Museum, Copenhagen; "Bryotheca exotica," cent. i., by Dr. E. Levier.

Purchased:—Kneucker, "Gramineae Exsiccatae," lief. xxiii.—xxiv.

Europe. *Presented*:—"Kryptogamae Exsiccatae," cent. xv.—xvi., by the Imperial Natural History Museum, Vienna; British seeds, by Mr. Clement Reid; critical British plants, by Mr. C. E. Salmon; named British marine Algae, by Mr. A. D. Cotton; named Greek plants, by Mr. M. Petitmengin.

Purchased:—Schneider, Balkan Peninsula; Fiori, Béguinot and Pampanini, "Flora Italica Exsiccata," cent. v.—vi.; Dahlstedt, "Herbarium Hieraciorum Scandinaviae," cent. xxi.—xxii.; Sydow, "Mycotheca germanica," fasc. xiv.—xv.

North Africa and Orient. *Presented* :—Algeria, named, by Mr. M. Petitmengin ; Eastern Caucasus, by Mr. St. G. Littledale ; Cyprus, by Mr. Clement Reid.

Purchased :—Murray, Canary Islands ; Gandoger, Tunisia.

Eastern Asia. *Presented* :—Forrest, Yunnan, by the Royal Botanic Garden, Edinburgh ; named Ferns, by Fleet-Surgeon C. G. Matthew.

Purchased :—Terasaki, Tokyo ; Monbeig, Yunnan, unnamed.

India and Malaya. *Presented* :—India and Thian Shan, by Lieut.-Col. H. Appleton ; Lhasa and Sikkim, by Lieut.-Col. L. A. Waddell, C.B., C.I.E. ; various named plants, by Lieut.-Col. D. Prain, C.I.E. ; Mosses, by Mrs. Prain ; Mysore, by Mr. A. Meebold ; Malay Peninsula, by the Botanic Gardens, Singapore ; named Laos Apocynaceae, by Mr. M. Petitmengin ; G. D. Haviland, Borneo, by Mr. J. H. Haviland ; Sarawak, by Mr. J. Hewitt ; Williams, Philippines, named, by the New York Botanical Garden ; Philippines, by the Bureau of Science, Manila ; Nepenthes, named, by the Royal Botanic Garden, Calcutta ; Ferns, named, by Fleet-Surgeon C. G. Matthew.

Purchased :—Elmer, Philippines.

Australasia. *Presented* :—Australia, by Dr. W. H. Ince ; New South Wales, named, by the Hon. J. H. Carruthers ; South Australia, named, by Miss E. J. Benham ; types of his new Queensland species, by Mr. F. M. Bailey ; Polynesian Selaginellae, by the Botanic Gardens, Sydney ; Smith, New Zealand marine Algae, by Mr. R. H. A. Shakespear.

Purchased :—Schlechter, New Caledonia.

Tropical Africa. *Presented* : – Sierra Leone, by Mr. C. W. Smythe ; Gold Coast, by Mr. H. N. Thompson ; S. Nigeria, by Mr. E. W. Foster, and by Mr. H. Dodd ; Dalziel, N. Nigeria, by the Imperial Institute ; N. Nigeria, by Dr. A. C. Parsons ; Rudatis, Cameroons, by Dr. H. Schinz ; Angola, by Dr. F. C. Wellman ; S. W. Africa, by Mr. E. E. Galpin, and Prof. H. H. W. Pearson ; British Somaliland, by Dr. R. E. Drake-Brockman ; Uganda, by Mr. C. B. Ussher ; Zanzibar, by Mr. J. T. Last ; Mozambique, by the Companhia de Moçambique ; Portuguese East Africa, Fungi, by the Transvaal Department of Agriculture ; named Apocynaceae and Myristicaceae, by the Royal Botanic Garden, Berlin.

Purchased ;—Zenker, Cameroons ; Scheffler, East Africa.

Mascarene Islands. *Presented* :—Seychelles, by Mr. J. Stanley Gardiner ; Mauritius, by the Governor of Mauritius ; types of new species from Madagascar, by Prof. H. Jumelle.

South Africa. *Presented* :—Cape Colony, named, by Dr. H. Bolus ; Gardner, Cape Algae, by Mr. E. M. Holmes ; S. Africa, named, by Dr. Hans Schinz ; Transvaal, by the Transvaal Department of Agriculture, and by the Transvaal Museum ; Thymelaeaceae, by the South African Museum, and by Mr. T. R. Sim.

North and Central America. *Presented* :— Western United States, by the United States National Museum ; Polyporeae, by Mr. W. A. Murrill.

Purchased :—Macoun, Canadian Mosses, cent. i.—ii. ; Palmer, Mexico ; Tonduz, Costa Rica, unnamed.

South America. *Presented*:—British Guiana, by the Botanic Garden, Georgetown; Brazil and Patagonia, by Dr. P. Dusèn.

Purchased:—Lehmann, Colombia, unnamed; Fiebrig, Paraguay and Bolivia; Ule, Bahia; Museo Goeldi, Amazons; Schroeder, S. Brazilian Pteridophyta.

An important acquisition was the Canary Islands herbarium of the late Rev. R. P. Murray. This is estimated to contain about 1,000 sheets, exclusive of duplicates, and will usefully supplement the older collections from the same group.

The Asiatic plants formed an unusually large proportion of those received during the year, and included over 2,000 sheets from the Philippines, 900 from Borneo, and 800 from Yunnan.

The botanical collections formed in the Seychelles during the "Sealark" Expedition, 1908, were communicated by Mr. J. Stanley Gardiner. They are estimated to include about 1,100 specimens, and should add considerably to our knowledge of the flora, when they are worked out.

Fewer African plants were received than has been usual of late years, but several of the collections were from less-known parts of the Continent. Among the more important was a set of over 400 numbers collected by Dr. J. M. Dalziel in the Katagum District, Northern Nigeria, and one of 360 numbers collected on Zanzibar Island by Mr. J. T. Last.

Research in Jodrell Laboratory in 1908:—

Boodle, L. A.—On the Production of Dwarf Male Prothalli in Sporangia of *Todea*. (Ann. Bot., Vol. XXII., pp. 231–243, t. 16.)

Boodle, L. A.—On the Occurrence of different Types of Hair in the Wallflower. (Ann. Bot., Vol. XXII., pp. 714–716, with one Fig. in text.)

[Boodle, L. A.]—Raffia fibre from Madagascar. (Kew Bull., 1908, pp. 207–208.)

Massee, G.—"Die-back" of Peach Shoots. (Kew Bull., 1908, pp. 269–271, with one plate.)

[Massee, G.]—Hollow Potatoes. (Kew Bull., 1908, pp. 139–140, with one Fig. in text; Journ. Board Agric., Vol. XV., pp. 287–288.)

[Massee, G.]—"Corky Scab" of Potatoes (*Spongospora scabies*, Mass.) (Journ. Board Agric., Vol. XV., pp. 592–599, with one plate.)

[Massee, G.]—The South African Locust Fungus. (Kew Bull., 1908, pp. 197–198.)

Massee, G. and Theobald, F. V.—The enemies of the Rose. (The National Rose Society, 1908, 84 pp., tt. 1–8, and Figs. 1–4). Fungus enemies by G. Massee, Insect enemies by F. V. Theobald.

Worsdell, W. C.—A Study of the Vascular System in certain Orders of the Ranales. (Ann. Bot. Vol., XXII., pp. 651–682, tt. 32–33, with four Figs. in text.)

Worsdell, W. C.—Internal Phloem in *Myristica*. (Ann. Bot., Vol. XXII., pp. 526–527, with two Figs. in text.)

Worsdell, W. C.—The Affinities of *Paeonia*. (Journ. Bot., Vol. 46, pp. 114–116.)

Mr. L. A. Boodle began an investigation on the hairs of certain *Cruciferae*, relating to the distribution of different types of hair, where more than one type is found in the same individual or species. Mr. Boodle also studied a remarkable insect-gall in an Indian grass, and made experiments on the extraction of rubber from tubers of *Raphionacme utilis* (Kew Bull., 1908, pp. 306–307), and continued some investigations on abnormal leaves of *Pinus* and other subjects : see above.

Miss E. M. Delf began a study of the ovule, embryo-sac, &c., in some members of the *Elaeagnaceae* and *Lauraceae*.

Mr. W. E. Hiley, in collaboration with Mr. L. A. Boodle, spent a short time in completing the work begun in 1907 on the vascular anatomy of some species of *Gleichenia*.

Mr. A. W. Hill carried out an investigation on the floral structure and biology of certain members of the *Gentianaceae*.

Dr. A. A. Lawson continued his researches on the morphology of the Gymnosperms, in which he deals more especially with the gametophytes, fertilisation and embryo. A piece of work on *Pseudotsuga* was completed, and Dr. Lawson also carried on a cytological investigation on one of the *Liliaceae*.

Mr. A. J. Maslen investigated the structure of *Poroxylon Sutcliffii*, a fossil stem from the English Coal-Measures, in continuation of the observations already made by Dr. D. H. Scott.

Dr. A. D. Waller, Mrs. A. D. Waller and Miss H. P. Kemp carried out a research on the conduction of stimuli in plants, the transference of the stimuli being tested by electrical methods.

Mr. W. C. Worsdell continued his work on Vegetable Teratology, and his investigations on the Vascular Anatomy of the Dicotyledons, and, in the latter subject, devoted his attention chiefly to the Ranales. Mr. Worsdell also made a special study of the rhizophores of *Selaginella* with regard to the morphological nature of these organs : see above.

Pathology.—The number of reports issued during 1907, dealing with plant diseases, was more than three times the number issued during the previous season. Those dealing with "Black Scab" of potatoes alone exceeded the total annual number of reports on every subject prepared a few years ago. American Gooseberry Mildew also monopolised a considerable amount of time, and when present only in the conidial condition necessitates very careful examination to distinguish between this and the conidial form of the European Gooseberry Mildew, as the two are frequently present on the same sheet. Two diseases of potatoes not previously recorded in Britain as epidemics, although known on the Continent and in Ireland, have been discovered on potatoes from Scotland and England sent to Kew for investigation. These are "Corky Scab" (*Spongospora solani*), and "Dry Scab" (*Spondylocladium atrovirens*).

Some field experiments bearing on the deterioration of potato tubers have been conducted during the past year, and will be continued next season.

A statement appeared in *The Agricultural Journal of the Cape of Good Hope*, XXII., p. 152, that spraying with a solution of arsenite of soda killed dodder (*Cuscuta*) parasitic on alfalfa without in any way injuring the latter. Plots of alfalfa, red clover, and white

clover respectively, each supporting a luxuriant growth of two kinds of dodder—*Cuscuta trifolii* and *C. Tinei*, an exotic species—were sprayed with a solution of arsenite of soda, according to directions. Two days after the first spraying, both kinds of clover and the alfalfa were thoroughly bleached and dead. The parasite soon after died from starvation. The above experiment proves that arsenite of soda cannot be used to exterminate dodder in this country.

Diseased material from various British colonies and dependencies, and other exotic sources have been received for examination at Kew.

Botanical Magazine for January.—The new volume begins with a plate of *Encephalartos Barteri*, Carruth., a West Tropical African Cycad, of which living plants and fresh female cones were sent to Kew early last year by Mr. J. Anderson, Curator, Agricultural Department, Gold Coast. In West Africa the plant is known as the Pardi Attar or "Ghost Palm," and it was first discovered by Barter during Baikie's Niger Expedition of 1858. This species has only once produced a cone under cultivation at Kew, where it does not thrive like other members of the genus. *Angadenia nitida*, Miers, is an Apocynaceous climbing shrub with sulphur-yellow flowers having a vermilion band on the corolla-tube. It is a native of Tropical South America, and was received at Kew in 1906 from the Trinidad Botanic Gardens. The Javan *Eria rhynchostyloides*, O'Brien, has small white flowers with a purple column, borne in dense curved racemes. The plant figured was presented in 1908 by the Hon. Walter Rothschild, and it is that upon which Mr. O'Brien based his description. *Clerodendron ugandense*, Prain, is a new species closely allied to *C. myricoides*, R. Br., figured at t. 5838 as *Cyclonema myricoides*, Hochst. As implied in the name, it is a native of Uganda, whence seeds were sent in 1906 by Mr. M. T. Dawe, who collected them in Voi, at 2000 ft. above sea-level. Its large violet-blue flowers render it an attractive autumn- or winter-flowering greenhouse shrub. The pretty *Lonicera Giraldii*, Rehder, is a recent introduction from Szechuen, Western China, seeds having been sent to Mr. M. L. de Vilmorin in 1899. The drawing was made from material supplied by Mr. M. L. de Vilmorin. The species is allied to *L. acuminata*, Wall., from which it may be distinguished by the somewhat narrower leaves which are clothed on both sides with a dense yellowish somewhat stiff indumentum.

Australian Saltbushes.—In the *Kew Bulletin*, 1896, p. 129, an account is given of sheep-bushes and saltbushes in various parts of the world. Mr. FRED TURNER, F.L.S. has forwarded to the Director of Kew an article on the Australian saltbushes which was published in the "Sydney Morning Herald" of June 20th, 1907. The article deals with the various species of *Atriplex*, *Chenopodium*, *Kochia* and *Rhagodia* which are found to be of considerable value as pasture plants in Australia. The following extracts have been taken from Mr. Turner's account. In the course of this

article Mr. Turner states that many pastoralists profiting by previous mistakes, are now fully convinced of the necessity of conserving these valuable forage plants, which have provided such excellent feed for stock during adverse seasons, and several experienced graziers are even going so far as to cultivate them. A good percentage of saltbushes in the pastures enhances the grazing capabilities of the country, and keeps stock in a healthy condition; moreover, their succulent stems and leaves assuage the thirst of the animals that browse upon them—a most important consideration in country where water is scarce. The plants are easily raised from seed, and may be increased by cuttings, so that there are no insurmountable difficulties in the way of re-establishing this valuable pasture herbage on those areas from which it has been eaten out after years of persistent stocking. With regard to *Atriplex semibaccata* the following statement is quoted from the report of the American Agricultural Experiment Stations:—"This plant has proved most valuable in some of the worst alkali spots of California. The full crop of a field is about 20 tons of green material, or, calculating on the basis of 75 per cent. of water, 5 tons of dry matter per acre. A good season would permit of two such crops. It seems to be already demonstrated that this Australian species of *Atriplex* will constitute itself a most important industrial factor in this State, and will render productive vast tracts of land which are at present a blot on the landscape. This important saltbush might be planted to advantage on some of the 'scalded' plains in the interior, aud thus they would be covered with herbage and rendered productive much sooner than under natural conditions."

Under the genus *Chenopodium* Mr. Turner refers particularly to three species. The "blue bush," *C. auricomum*, is a superior forage plant found on the inland plains, where it often grows 5 ft. high or more. Its stems are clothed with almost triangular-shaped leaves from 1 in. to 2 in. long, and it is easily recognised on the plains by its almost golden hue—hence its specific name *auricomum*. Sheep and cattle are particularly fond of it, and stockmen speak very highly of it, both for its nutritive properties and its wholesome qualities. The succulent stems and leaves of this "blue bush," for there are others, are an excellent table vegetable when cooked and served in a similar way to spinach. The "goosefoot saltbush," *C. atriplicinum*, rarely grows more than 1 ft. high, but it branches freely from its thick base, and often forms a dense mass of nutritious succulent herbage, much relished by all herbivora. Its tap-like root penetrates deeply into the earth, and in consequence the plant is often green when the surrounding herbage is brown. The "nitre bush," *C. nitrariacea*, is a branching undershrub of from 3 ft. to 4 ft. in height, though under cultivation it grows 8 ft. high and 6 ft. in diameter. It is fairly common on some of the inland plains, and sheep in eating this bush often trim it as neatly as if it had been clipped with hand-shears. It withstands a lot of dry weather, and no matter how closely it is cropped soon puts forth new growth.

The genus *Kochia* includes fifteen known species. One of the best and most favourably known to stock owners is the "cotton bush" (*Kochia aphylla*), so called from the woolly-like galls which form on the plant during periods of prolonged dry weather, and

which are generally supposed to be caused by some insect. The "cotton bush," which grows from 2 ft. to 3 ft. high, occupies large tracts of country in the interior, and its presence is nearly always an indication of good grazing land. Stock of all kinds are remarkably fond of this plant, on which they thrive and fatten. In dry seasons on some stations quantities of it are cut and chaffed before being fed to stock. The chaffed material after being cut a few days has a perfume like new mown hay. Sometimes "cotton-bush" is chaffed with "mulga" (*Acacia aneura*) and "belar" (*Casuarina glauca*), and horses and bullocks are said not only to work well but to fatten on this feed. In any system of conservation of saltbushes this shrub should be amongst the first to receive attention. The "grey bush" (*K. pyramidata*) is a many-branched shrub, growing 3 ft. high or more. The whole plant is covered with a soft tomentum of a greyish colour, hence stockmen called it "grey bush." It occurs over an immense area in the interior, and is quite a feature on some of the plains. This saltbush generally grows on good land, and it is probably on that account that it thrives during prolonged dry weather. Sheep are particularly fond of this plant, and analysis shows that it possesses good feeding value.

Most of the species of the genus *Rhagodia* are excellent forage plants, the tallest being *R. parabolica*, which sometimes attains a height of 15 ft. Two of the dwarfest species of this genus are the "flax-leafed saltbush" (*R. linifolia*) and the "nodding saltbush" (*R. nutans*) and they are found both in the coastal districts and in the interior. Sheep are particularly fond of and thrive on their slender, herbaceous stems. The "halbert-leaved saltbush" (*R. hastata*) grows from 2 ft. to 3 ft. high in a natural state, but attains a height of 5 or 6 ft. under cultivation. This is the saltbush that is so largely grown as a hedge plant, for which purpose it is admirably adapted, as it will withstand any amount of clipping without injury. In the interior, sheep, when eating the succulent stems and foliage of this plant, often trim it as neatly as if it had been clipped into shape by hand-shears.

There are very few members of the saltbush family that are not suitable for forage purposes, though exception may be taken to those species whose stems, leaves, and fruit are enveloped in a cottony or woolly substance, for sheep have died after eating too freely of this indigestible stuff together with parts of the plants. The dorsal spines on the fruits of all species of the genus *Anisacantha* cause some trouble to the salivary glands of sheep and other small herbivora if they eat too much of the plants when the fruits are near maturity. Stock, however, eat most of these saltbushes without any serious consequences when the stems and leaves are young and succulent. *Anisacantha muricata*, when dry, makes the troublesome "roley-poleys" which the wind occasionally blows over some of the inland plains to the consternation of horses and cattle. Stockmen call the ripe fruits of the various species of *Anisacantha* "bindyhies," and they are often a terror to those who camp out in country where the plants that produce them grow. Once these fruits, with their adherent spines, get into a blanket, they can rarely be removed.

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 2.] [1909.

VI.—THE VARIETIES OF THE OIL PALM IN WEST AFRICA.

(*Elaeis guineensis*, Jacq.)

Several accounts of the mode of preparation of the Palm oil in West Africa have appeared in the pages of the *Kew Bulletin*. The first of these, under the title of the Oil Palm in Labuan (*K.B.*, 1889, pp. 262–264), contains an interesting despatch from the Governor of the Gold Coast on the Palm oil industry in West Africa, dealing with the cultivation of the Palm and the manufacture of the oil. In the volume for 1891, pp. 190–192, a further account of the preparation of the oil on the Gold Coast is given with fuller details of the process. The Palm oil industry in Lagos is dealt with in the following year (*K.B.*, 1892, pp. 200–208), and illustrations of the Palm itself and of the method of preparation of the oil are given. There is also a short note on the Oil Palm in Sierra Leone (*K.B.*, 1893, p. 168).

In February of last year the attention of Kew was again called to the question of the West African Palm oil industry by the Secretary of State for the Colonies, who sent a copy of a letter from the West African Trade Association to the Director, in which the possibility of improving the cultivation of the West African Oil Palm is suggested. In the course of the letter reference is made to "a species of palm which bears soft-shelled kernels."

In his reply to the Secretary of State for the Colonies on the question of the need of further information on the Palm oil industry, the Director of Kew suggested that information should be supplied by the local authorities to show :—

"(*a*) To what extent the existing supplies of Oil Palm kernels are taken advantage of by traders; (*b*) whether an Oil Palm with soft-shelled kernels is known on the West Coast of Africa, and if so, in what districts it is to be found; (*c*) how far increased facilities of communication have tended to increase the quantity of palm oil reported during recent years; (*d*) how far improved methods of extracting the oil have tended to improve the general quality of the oil produced; (*e*) how far the higher quality of one known variety of Oil Palm compensates for the presumably smaller quantity of oil yielded by its kernels as compared with that yielded

(12371—6a.) Wt. 35—183. 1375. 3/09. D & S.

by other known varieties; (*f*) the relative abundance of the three known varieties; (*g*) the precise degree of moisture in the soil required to ensure a maximum yield of oil; (*h*) the extent of country in which this condition of moisture prevails; (*i*) the number of seasons during which an Oil Palm maintains a maximum yield."

In the following pages the answers to questions (*b*) and (*f*) only are considered and summarised. In a further note it is hoped to give extracts from the various reports which have been received in answer to the other questions put forward by the Director:—

With regard to the variety of the Palm bearing soft-shelled kernels, no specimens existed at Kew and the only allusions to such a variety, in British West Africa, before this time are to be found in an article contributed by Mr. A. E. Evans, Travelling Instructor of Agriculture, Gold Coast, to "Tropical Life," October 1907, p. 146, and in a "Note on the cultivation of the Oil Palm," by Dr. E. Drabble in the "Quarterly Journal" of the Institute of Commercial Research in the Tropics, Liverpool University, January 1908, p. 19.

The information in both cases, which is due to Mr. Evans, is to the effect that four well-marked forms of the Oil Palm can be distinguished in the Gold Coast, and of these No. 4, "Abobo-be" or "Yue Wyiam" is said to be the best variety on the Gold Coast. "The shell of the kernel is much thinner than that of the other varieties, and is so soft that it can be cracked with the teeth."

A further reference to the soft-shelled kernel is to be found in an article entitled "Notes on the Oil Palm of Southern Nigeria" by Mr. H. N. Thompson, Conservator of Forests, which was published as a supplement to the Southern Nigeria Government Gazette, No. 10, February 5th, 1908. According to Mr. Dawodu, assistant curator, to whom much of the information in these "Notes" is due, a variety of the Oil Palm "Ope-Arunfo" is known and is "distinguished by its fleshy small nuts and soft kernels," Mr. Thompson, however, was unacquainted with this form. Towards the end of the past year a good deal of information has been received from the several West African Colonies, in answer to the questions asked by the Director, as to the different varieties of the Oil Palm, and some specimens have been received at Kew which have thrown some light on the different forms.

Reports on the Oil Palm industry have been received from the Governors of Southern Nigeria, Northern Nigeria, the Gold Coast, Sierra Leone and the Gambia. Specimens have been sent to Kew from Southern Nigeria by the Provincial Forestry Officer, Benin City, Central Province, consisting of fairly complete botanical material of three varieties of the Oil Palm; by the Provincial Forestry Officer, Eastern Province, by direction of the Conservator of Forests, consisting of fruits only of four varieties. From the Gold Coast, Mr. A. E. Evans has sent two consignments containing fruits of most of the varieties of the Oil Palms referred to in his letter printed below.

Although the material which has been sent is not sufficiently complete to allow of final conclusions as to the botanical nature of

the different varieties, it has made it possible to co-ordinate the information on the subject from West Africa generally and to formulate certain suggestions.

The problems involved call for further careful work in the field, though it would no doubt be possible with complete material from different localities to arrive at some definite conclusions as to the botanical nature and the stability of the numerous forms, varieties and perhaps species of *Elaeis*.

It is partly in the hope that these questions may further engage the attention of those on the spot that the following account of the varieties of the Oil Palm has been drawn up:—

Southern Nigeria.

At the beginning of 1908, when attention was being drawn to the possibility of improving the cultivation of the Oil Palm, some useful 'Notes' were prepared by the Conservator of Forests (Mr. H. N. Thompson), at the request of the Commercial Intelligence Officer of Southern Nigeria. They deal more particularly with the cultivation of the Palm and preparation of the oil in Agege and Egba land, Western Province, where a good deal of attention has been paid by the more intelligent farmers to the subject. These districts were visited by Mr. Dawodu, assistant curator, and it seems probable that his visit may result in a more careful observation as to the best conditions for the growth and yield of the Palm.

Western Province.—The following information relating to the Oil Palm in the Western Province is extracted from the 'Notes' already referred to.

"In the Western Province, besides the ordinary typical species, two other varieties or sub-species are known.

"They are the Ope-Ifa and Ope-Arunfo of the Yorubas. The former is distinguished by the kernel of the nut having four or more 'eyes' (pores in the endocarp, opposite which the embryos are situated), instead of the three ordinarily found in the typical species. The pinnae (leaflets) of the leaves, moreover, are not split down to the mid-rib as is the case with the ordinary species, the basal third or so of the leaflets being adherent one to another. This peculiarity gives the leaves a massive, heavy character by which the variety can be at once distinguished from the others at a distance. The leaves are also usually of a darker shade of green.

"Branched individuals of the Ope-Ifa are sometimes met with (Mr. Dawodu).

"The oil prepared from the nuts of this variety is said to boil over with violence during the preparation.

"This variety is quite common in the vicinity of Lagos, and appears to favour the sandy country bordering the sea-shore and the lagoons.

"It gets scarcer as one proceeds up country into the hinterland.

"The Ope-Ifa is so well marked and established that I am inclined to look upon it as a true species. The Yorubas look upon it as a sacred tree, and the differences between it and the typical

species are sharply marked, and I have never yet come across individuals possessing characters intermediate to those of the two types.

"The second variety, the Ope-Arunfo, is distinguished by its 'fleshy small nuts and soft kernels' (Dawodu). I am not acquainted with this plant, and am unable to separate it from the ordinary typical species. According to Mr. Dawodu, the latter gives a better yield, both in nuts and oil, tree for tree, than either of the two above-mentioned varieties."

The thin-shelled variety has been found in the Agege and Abeokuta and Oshogebo districts.

Central Province.—From the same source, the following information—supplied by Dr. Unwin—is taken with regard to the three varieties of Oil Palm found in the Benin district, Central Province :—

"(*a.*) The Udin of the Benis. This is the commonest of the three, and is the typical plant. It bears, when mature, two to seven bunches of nuts ; the latter are of small size, but very numerous on each bunch.

"(*b.*) The sparsely distributed Ogedudin, or King Palm tree. It bears about the same number of bunches of nuts as the former, but the individual nuts are longer and contain a very small kernel. I have seen a specimen of this plant in Benin City, where it is looked upon as sacred, and find that it belongs to the same variety as that known to the Yorubas as the Ope-Ifa.

"(*c.*) The none too common Agonokwi, with small bunches of fruit containing from 20 to 40 nuts only. The latter are, however, very large, and the oil is only used for cooking purposes. It is said to spoil the commercial article when mixed with it."

The material of the leaves, male flowers, fruit and seeds of the three following varieties of the Oil Palm collected at Oka, Benin district, have been received at Kew from the Provincial Forestry Officer, Benin City :—

Benin	*Yoruba*
(1.) Ivioronmila	Ope-Arunfo
(2.) Ogiedi, Ogedudin	Ope-Ifa
(3.) Udin	

No. 2 is said to be distinguished from other varieties in having the pinnae joined together ; also it is not used for food purposes but only in medicine. According to Dr. Unwin this variety is the King Palm tree (Ogedudin or Ope-Ifa) ; in the Gold Coast this variety is known as Abe-Ohene, and it is considered that it may have been introduced from Southern Nigeria. It seems probable from the report of Mr. Hitchens (*see* p. 37) and from the material sent by the Conservator of Forests that this variety is the same as the Af-fia-ko-jub or Afia-okpo-Eyop of the Eastern Province.

No. 3. Udin according to other reports reproduced below, appears to be the Ope-Pamkora of the Yorubas (Ok-poruk-pu of the Ibos), and is the typical form of *Elaeis guineensis*.

Eastern Province.—With regard to this region information has been received through the Secretary of State for the Colonies from Sir W. Egerton, Governor of Southern Nigeria, and fruits and

seeds of the Oil Palm have been received at Kew from the Conservator of Forests. The thin-shelled variety is quite common and well known in this Province, and the yield of oil both from the pericarp and from the kernel is stated to be greater and of a better quality than that obtained from other varieties.

According to the report of Mr. C. Hitchens, Provincial Forestry Officer, Eastern Province, June 1908, three principal varieties of the Oil Palm may be recognized, all of which have native names though they have not yet been botanically differentiated. In the Ikot-Ekpene and Uyo districts the varieties are named as follows by the Efiks and Ibibios :—

(1.) A-sog-e-jub = Soft shell palm nut
(2.) Ak-por-ro-jub = Hard shell palm nut
(3.) Af-fia-ko-jub = White palm nut

By the Ibos, the most numerous and extensive oil-producers in the province, these varieties are known as :—

(1.) Au-su-ku (2.) Ok-po-ruk-pu (3.) O-ju-ku

From rough linear valuation surveys the distribution of the three kinds in the moist zone is assessed as follows :—

(1.) 30 per cent. (2.) 60 per cent. (3.) 10 per cent.

The following characteristics are given for these different varieties :—

No. 1. Very large cones studded with large, comparatively soft drupels ; exocarp deep purple almost black ; mesocarp abundant, full of oil ; endocarp comparatively soft, adherently enveloping a small, irregularly-shaped seed full of oil of a superior quality. No. 2 produces large cones studded with deep orange and purple drupels ; exocarp comparatively thick ; mesocarp less abundant and oily ; endocarp thick, hard, enveloping a large seed full of oil. No. 3 produces small cones of light, orange-coloured drupels ; exocarp thick and tough ; mesocarp very scanty, containing very little oil ; endocarp thick, hard, horny, enveloping a very large seed, sufficiently detached from the endocarp to rattle when dry.

In November, 1908, fruits and seeds of four varieties of *Elaeis guineensis* were sent to Kew by the direction of the Conservator of Forests with their various native names :—

	Efik.	*Ibo.*	*Ibibio.*
(1.)	Ösök Eyop	Osuku	Eduege Eyop
(2.)	Ökpörö Eyop	Okporokpo	Ikrök Eyop
(3.)	Afia Ökpö Eyop	Ojina	Efiako Eyop
(4.)	Mbana Eyop	Ekuebuba	Ayarambana Eyop

The three first-named varieties apparently correspond with those mentioned above, and the following particulars are given as to the fruits and seeds :—

"No. 1. This has a large fruit of a deep orange-claret colour becoming yellower at the base ; the fruits of this variety are longer than the others ; the pericarp is very rich in oil ; the best oil of all is obtained from this variety.

'No. 2. This has a large fruit, shorter and larger round than No. 1, of a red-yellow colour ; the fruit is the most angular of all the varieties ; it is very nearly as valued for its palm oil and kernels as No. 1.

"No. 3 has a large bright yellow fruit, with a very thin pericarp which contains little oil, covering a very large nut; the cobs of this variety are never cut down for palm oil, but are allowed to rot on the palm tree till the nuts fall to the ground, here they lie till all the fibrous fleshy pericarp has rotted off them; they are then collected and cracked for their kernels. The oil from this variety is light coloured, the fruits are used in native sacrificial ceremonies.

"No. 3 is never used for palm oil. This variety appears to be known in the Central Province and in the Gold Coast as the King Palm and to be the Ope-Ifa of the Yorubas.

"No. 4 has a light red-coloured fruit shading off to claret colour at the end; it is the smallest of all the varieties, but both palm oil and kernels are obtained from it."

In a further report from the Acting Conservator of Forests, dated August 10th, 1908, the names of the varieties are given as follows:—

	Ibo.	*Efik.*	*Yoruba.*	*Beni.*
(1.)	Au-su-ku	A-soge-e-jub	Ope-arunfo	
(2.)	Okporukpu	Akponojub	Ope-Pamkora	Udin
(3.)	Af-fiako-jub	Ojuku		

No. 2 is the typical form of *Elaeis guineensis* and is said to be by far the commonest in the Western and Central Provinces as the other two varieties together comprise a very small fraction of all the Oil Palms. The proportion of the thin-shelled variety, No. 1 Au-su-ku, in the Western Province is about 2 per cent. (Dawodu), and in the Central Province it is quite uncommon. In the Eastern Province this latter variety appears to exist in the proportion of 30 per cent. (Hitchens).

It is of interest to notice that the Governor of Southern Nigeria has issued instructions for the formation of a small Government plantation of this thin-shelled variety.

In connection with the experimental plantation which has been made in the Cameroons (*see* pp. 44, 45, and 47) the results from this plantation will be eagerly awaited.

Gold Coast.

The thin-shelled variety, as has already been pointed out, was first brought to the notice of Kew from the Gold Coast. On August 19th, 1908, Mr. A. E. Evans forwarded samples of three varieties of the Oil Palm to the Director of Kew with the following information, which is extracted from his letter:—

"By this mail I am sending you three small sample bags of palm nuts marked:—

I. Abobo-be, soft-shelled nut.
II. Abe-tuntum, hard nut.
III. Abe-pa, hard nut.

"The Abobo-be variety is exceedingly interesting, and appears to be widely distributed all over the Colony. From information I have been able to gather it does not appear to come true from seed, although the tree appears to yield the same nuts each year. It is impossible to distinguish one variety from the other without seeing the nuts."

Some additional information from the Gold Coast was received at Kew at the end of November, 1908, in a despatch from the Governor of the Gold Coast to the Secretary of State for the Colonies, transmitting an interim report on the Oil Palm, from the Acting Director of Agriculture (Mr. A. E. Evans) under the date of August 24th, 1908.

The two following paragraphs, relating to the different varieties of fruits to be met with, are extracted from this report :—

"There are undoubtedly six varieties of fruits of the oil palms in this Colony, but it is very doubtful if they are distinct species. In all probability the one known as Abe-Ohene and that known as Abobo-be will be found to be different species, but the remainder will, no doubt, be found to be variations from the true *Elaeis guineensis*.

"The form known as Abobo-be in this Colony somewhat resembles that described by Dr. Preuss in the Cameroons as Lisombe, but I am inclined to think it must be a different species, as the Abobo-be in this Colony is smaller than the other varieties, but has a much thicker fleshy pulp; the Lisombe of the Cameroons is said to be a much larger fruit, and Dr. Preuss states that the average weight of the Lisombe fruit (arrived at from thirteen bunches) was 10·24 grammes, whereas the average weight of Abobo-be is only 6·25 grammes."

On the 25th January, 1909, a further despatch from Sir John Rodger to the Secretary of State for the Colonies was received at Kew through the courtesy of the Under-Secretary of State. The Governor in continuation of his former despatch enclosed a further report, dated December 3rd, 1908, from Mr. Evans, Travelling Instructor of Agriculture, the portion of which referring to the varieties of the Oil Palm is here reprinted.

"It is very difficult to give with any degree of accuracy the relative abundance of the known varieties of oil palms, so, for the purpose of this report, I have classed them under three groups :—

"1st group :—

Fruits large; colour of pericarps varies from yellowish-white to blackish-red; nuts hard.	1. Abe-pa. 2. Abe-dam. 3. Abe-tuntum. 4. Abe-fita or fufu. 5. Adi-be. 6. Abubu-be.

"2nd group :—

Fruits small: very fleshy pericarps, with thin soft-shelled nut.	7 Abobo-be.

"3rd group :—

Fruits large; pericarps brick red; nut hard; leaflets joined together at the base.	8. Abe-Ohene.

1st Group.

"1. Abe-pa. This variety appears to be the most abundant; it is widely distributed all over the Colony. The fruits are pointed

at the apex, and contain a very hard thick nut; the pericarp is very thin, and of a dark reddish colour. The yield of oil worked out by native methods is 11·2 per cent.

"2. Abe-dam. 'The false or crazy oil palm'; shape similar to Abe-pa; pericarps yellowish-red; nuts very hard. Widely distributed over the Colony. Yield of oil 11·2 per cent.

"3. Abe-tuntum. Fruits nearly spherical; pericarps black at the apex and red at the base; nuts hard. It is widely distributed over the Colony, but not so abundant as the two former varieties. Yield of oil 13·7 per cent.

"4. Abe-fita or fufu. 'The white oil palm.' Fruits very large; pericarps reddish-white, and occasionally streaked with black; nuts hard. This variety is exceedingly scarce, only a few trees being known. The oil is of a yellowish colour, and quite distinct from the other varieties. Yield of oil 15 per cent.

"5. Adi-be. Fruits long, with small hard nuts. Pericarps very fleshy, brick red, black at apex. This variety is exceedingly scarce,. Yield of oil 28 per cent.*

"6. Abubu-be. Fruits resemble Abe-tuntum. Pericarps very fleshy; fibre in the pericarps very short, and, after being beaten, it looks as if it had been ground in a machine. This variety is very scarce, only a few trees being known. Yield of oil 25 per cent.*

2nd Group.

"7. Abobo-be. 'The soft-shelled oil palm.' Fruits medium size, similar in shape and colour to Abe-tuntum. Shells of the nut very thin, and can easily be cracked with the teeth. Not very abundant, but found in the Eastern and Central Provinces. It is undoubtedly the pick of the collection. Average yield of oil, 19·3 per cent. Two experiments 'A' and 'B' carried out with this variety are given below. In the former the oil was extracted by boiling, and in the latter the oil was extracted by ether—

	A.	B.
Oil	23·07 per cent.	25·60 per cent.
Fibrous waste	6·25 "	18·40 "
Shell and kernel ...	24·03 "	44·00 "
Loss during process ...	46·63 "	12·00 "
Total	99·98	100·00

3rd Group.

"8. Abe-Ohene. 'The king palm.' Fruits medium size; pericarps brick red, streaked with black, leaflets joined together at the base. Very graceful, tree exceedingly scarce; found at Piapiasa, a village some five miles from Aburi. Probably introduced from Southern Nigeria. Yield of oil, 15 per cent.

"I have not got statistics to give replies as to the quality of the various oils, but locally there is no distinction made, as the natives do not keep the oil produced by the various varieties separate. I

* *See* Anderson, J., Report upon Bot. and Agric. Dept., Gold Coast, for 1907, p. 20.

have forwarded to the Director of the Imperial Institute samples of the various oils; and his report on them, as to their respective commercial values, will be of special interest."

Of the six forms included under Group 1, that named Abe-fita or fufu appears to be the most distinct. Both in the character of its oil and in the retention of the style and stigmas by the ripe fruit, this form may be easily distinguished from the others; but whether these characters are combined with others which, taken together, may be of sufficient importance to raise this form to specific rank, cannot be known until adequate botanical material has been examined. The varieties Adi-be, Abubu-be and Abobo-be appear to be the most valuable.

Gambia and Sierra Leone.

The different varieties of the Oil Palm do not appear to be recognised by the natives either in the Gambia or in Sierra Leone. In the despatch of the Acting Governor of Sierra Leone to the Secretary of State for the Colonies, the following paragraph occurs—"The Agricultural Superintendent reports as follows . . . 'So far as I am aware, the oil palm as it occurs in this Colony cannot be divided into distinct varieties.' This statement is supported by Dr. Maxwell, the District Commissioner of the Railway District, who states that there may be differences in the thickness of the shell, but in no case has he seen what would be considered as a thin-shelled kernel."

Dahomey.

From the account by M. N. Savariau,* Chef du service d'Agriculture in Dahomey, the different varieties of the Oil Palm appear to be well known to the French, and specimens of well-marked, thin-shelled, and thick-shelled varieties were presented to Kew from the French West African section of the Franco-British Exhibition, by M. Max Robert.

"According to the natives of Dahomey," says M. Savariau, "certain palms give fruits with a soft shell (noyau) easily broken by the teeth. These fruits are used in their natural state, or are set apart to make an oil of excellent quality. The palms which produce them are not distinguished by any external character from the common palm."

Two other varieties are also recorded from Dahomey in the same work, viz.—"The common variety, with fruits the size of a pigeon's egg, with a hard shell," and "a well-recognised variety known as 'Palmier fétiche,' used for holy oil." This latter variety, of which an illustration is given, appears to be the "King Palm," or var. No. 3 of the Eastern Province lists.

Whilst this account of the Oil Palm in British Dominions was in the press the series of articles—not yet completed—on the Oil Palm in French West Africa, by M. J. Adam,† Inspector

---

* "L'Agriculture au Dahomey," N. Savariau, 1906, p. 64. Gouvernement Général de l'Afrique Occident, Française; Colonie du Dahomey.

† Adam, J. Le Palmier à huile et le Cocotier en Afrique Occidentale Française in L'Agriculture pratique des pays chauds; Bulletin Mensuel du Jardin Colonial, 1908, No. 68, pp. 380-389; No. 69, pp. 466-475; 1909, No. 70, pp. 35-46.

of Agriculture in French West Africa, came to our notice. They contain an admirable summary of the information which has been collected as to the varieties of the Oil Palm in the French possessions together with abstracts of papers on the Oil Palm in Togoland and the Cameroons (*see* below).

It is of interest to notice that M. Adam has treated the subject in a precisely similar manner to that which has been adopted in this article and that his conclusions are on the same lines as those here reached.

In Dahomey five varieties of *Elaeis guineensis* are recognised:—

(1.) Dégbakou ...	...	Thin shelled variety.
(2.) Fadé, Agoudé	...	(Palmier fétiche).
(3.) Dé (djè-djè)	...	The common variety.
(4.) Kissédé, Sédé	...	A variety with green tinted fruits.
(5.) Votchi ...	...	A variety without a definite shell.

The variety Fadé is the King Palm, the oil of which is only used for religious purposes ; it is distinguished from all others by the characters of the leaves (*see* below, also pp. 35, 36), of which an excellent picture is given. (Fig. 20, p. 496.) The other varieties can only be distinguished by their fruits ; in their leaves they are like the normal form of the Oil Palm.

The varieties Dégbakou and Votchi are of considerable interest, the former is the now well-known thin-shelled oil palm with a shell of about 1·5 mm. in thickness, but the latter appears to be a form unknown, or at least unrecorded, in British Dominions. In this variety the shell is said to have lost all resistance and to be reduced to a felt of fibres which yields to slight pressure. The kernel, if it exists, is very small and is often reduced to the mere embryo which is situated at the upper end of the fruit in the pulp. The felt of fibres represents the shell. This variety possesses the most abundant and most savoury pulp. Figures of the fruits of this variety and of Dégbakou are given by M. Adam on p. 468 (figs. 18, 19). The variety Votchi appears then to be a form of the thin-shelled variety in which the reduction of the shell has been carried to an extreme limit. It is affirmed by some of the natives of Dahomey that the different varieties of the Oil Palm, and especially the varieties Dégbakou and Votchi, do not come true from seed (*cf.* Evans, p. 38, Gruner, p. 43, Strunk, p. 45), many on the other hand declare that the different forms will reproduce true from seed.

In the varieties Dé and Kissédé the thickness of the shell is given as 4 mm. and 3·5 mm. respectively.

Three varieties of Oil Palm are also recorded from the Ivory Coast under the names Adé quoi, Aquoi sran, and Adé sran, the latter with a shell 1·5 mm. in thickness may be the thin-shelled variety. It is of interest to notice that a palm is recorded from the region of Bingerville which bears male flowers only—Adé sé—the stem remaining covered during life by the remains of the old leaf bases.

In Guinea and Senegal only one type of Oil Palm appears to occur.

Togoland.

According to the report of the Governor,* and from the paper by Dr. Gruner,† four varieties of the Oil Palm are known in Togoland.

They bear the following native names—

(1.) Dé-dé-bakui ... Dechla (Gruner).
(2.) Agadé ... ... Agodé or Klude (Gruner).
(3.) Dé ... ... Ede or Deti.
(4.) Dé dé ... ... Sedde.

No. 1 has thin shells which can be broken with the teeth and is said to require much moisture to grow in perfection; in a dry climate it approaches the common form. It is spread everywhere in the proportion of about 25 per cent. (Governor, Togo) and of 3–10 per cent. in the palm groves of Misahöhe (Gruner).

No. 2. This is the sacred palm. According to the Governor of Togo, it appears to be regularly cultivated and "Les féticheurs" cast lots with the nuts of this palm. Gruner states that the calyx segments are fleshy, red and contain oil. The leaves are easily recognised by their fused segments, but it is affirmed that these palms are never cultivated since only the common Deti is produced from the seeds of Klude.‡ To solve this question, Dr. Gruner states that he sowed 2,000 seeds of Klude at Misahohe in the spring of 1903, but the results do not yet appear to have been published.

No. 3 is the typical form of *Elaeis guineensis*.

No. 4 contains less oil than the typical form and does not appear to be a plant of great value.

Angola.

From Angola§ four varieties are reported :—

(*a.*) Varieties with a thin or cartilaginous shells and oblong fruits—
  (1.) Disombé ... ... Thin shell cracked by teeth.
  (2.) Digumbé ... Shell reduced to fibrous strands.
(*b.*) Varieties with a hard bony shell—
  (1.) Dihohô ... ... Black epicarp becoming yellow-orange.
  (2.) Dihûsué ... ... Epicarp retaining greenish tinge at the base.

Welwitsch in his "Apontamentos," p. 584, describes two varieties of the Oil Palm.—(1) A var. *macrosperma* (Dihôhó) from Icolo, and Bengo, Angola, which, from his description, appears to be a thick-shelled variety of the typical Oil Palm. The endocarp is 4–4·25 mm.

---

* *See* Adam, J., l.c., 1908, p. 467.

† Dr. Gruner. Die Oelpalme im Bezirk Misahöhe, Togo, in *Der Tropenpflanzer*, VIII., 1904, pp. 283–291.

‡ Gruner, l.c., p. 284.

§ *See* Adam, J., l.c., 1908, p. 466, quoted from Almeida, J. J. Noticia sobre a Palmeira de Denden. Lisbon, 1906.

thick. (2) A variety with the native name of "Disombo," to which he gave the name var. *microsperma*, Welw., and the description "Palma spectabilis, monoica, oleifera et vinum optimum praebeus, idigena et freq. culta." His specimens in the British Museum have been examined, and are found to have thin shells of about 1 mm. in thickness, and to be very similar to the "Lisombe nuts" from the Cameroons, and the thin-shelled "nuts" from other localities.

Cameroons.

An account of the Oil Palm industry in the Cameroons was given in *Der Tropenpflanzer*, vi., 1902, pp. 450–476, by Dr. Preuss, in the course of which (p. 456) reference is made to a special variety of the Oil Palm known to the Bakwili as "Lisombe" or "Isombe." The fruits are like those of the ordinary Oil Palm, but differ in their thinner shell, which is the characteristic feature of the variety. The thickness of the shell is about that of the hazel-nut, and negroes crack them with their teeth. It is also stated that there appear to be two forms of Lisombe, according to the size of the fruit and kernel, but that they are not separated by the natives.

Of this variety only four plants are known at Victoria, but it is more frequent at Duala in Bassa Dörfen and in Bakoko.

In *Der Tropenflanzer*, 1906, p. 172, it is stated that 20,000 seeds of the Lisombe were distributed to stations and plantations from the Botanic Garden, Victoria.

From a few specimens of this variety in the Imperial Institute, it seems highly probable that the soft-shelled Lisombe is the same plant as the soft-shelled Oil Palm of British West Africa, Dahomey and Angola.

A more recent paper on the Oil Palm in the Cameroons by Dr. L. Strunk* supplements the information given by Dr. Preuss.

In his first "Table" particulars are given of eight varieties of the Oil Palm from the Cameroons which are compared with two from Togo taken from the account by Dr. Gurner. From the ratio of kernel to shell as shewn in this table, the most valuable varieties of Oil Palm can easily be seen.

The Lisombe and three other varieties with similar characters, Avelle, Mbié and Nségelén are considered to be the best.

One of the most important parts of this paper, however, deals with the question of the constancy of a given variety when grown from seed.

Lisombe seeds were sown at Victoria in the spring of 1902, from which 17 plants were raised, and seven of these up to the time of the publication of his paper (1906) had flowered and borne fruit, two of these had not yielded enough fruit for complete investigation but the shells when unripe were 2·5 mm. in thickness.

---

* Strunk, Dr. L., "Zur Ölpalmenkultur," in *Der Tropenpflanzer*, x., 1906, pp. 637–642.

From Dr. Strunk's Table reproduced below it will be seen that only two of these plants (Nos. 1 and 5) shew the characters of the Lisombe Palm.

TABLE II.

No.	Fruit. g.	Fruit Flesh. g.	Seed. g.	Ratio of flesh to seed.	Kernel. g.	Shell. g.	Ratio of kernel to shell.
1 ...	7·48	5·86	1·62	3·61 : 1	0·60	1·02	0·59 : 1
2 ...	15·09	5·00	10·09	0·49 : 1	2·64	8·44	0·31 : 1
3 ...	9·76	3·72	6·04	0·61 : 1	1·60	5·24	0·31 : 1
4 ...	10·04	2·32	7·81	0·28 : 1	1·71	6·09	0·28 : 1
5 ...	9·04	6·16	2·88	2·14 : 1	1·04	1·84	0 56 : 1

It is suggested in the paper that in the course of time the inferior seedlings might approach the Lisombe in character and that the Lisombe may be a sport whose peculiarities are only transferred with delay to its offspring (*see* Note on var. No. 1, Togoland, p. 43).

This experiment appears to confirm the native reports referred to by Mr. Evans (p. 38), and M. Adam (p. 42) that the thin-shelled variety of the Oil Palm will not come true from seeds. The explanation put forward by Dr. Strunk does not however appear to be very convincing.

SUMMARY.

From the information from various sources, given in detail, it appears that at least three distinct and fairly definite forms of the Oil Palm are to be met with in West Africa :—

(1.) **The typical form** of *Elaeis guineensis* appears to be known under the following native names in Southern Nigeria: Udin (Beni), Ope-Pamkora (Yoruba), Ak-por-ro-jub, Okporo Eyop (Efik), Ok-po-ruk-pu, Okporokpo (Ibo), Ikrök Eyop (Ibibio). In the Gold Coast it seems likely that the forms known as Abe-pa and Abe-dam represent the typical Oil Palm, and that Abe-tuntum, Adi-be* and Abubu-be* should also probably be included. In Dahomey the varieties Dé, Kissédé ; Togoland, Dé, Ede or Deti ; Angola, Dihohô, Dihûsué all appear to represent the typical variety of *Elaeis guineensis* called by Welwitsch var. *macrosperma*. In the Flora of Tropical Africa, viii., p, 125, this variety is not maintained. The thickness of the endocarp in Abe-pa is from 3–4 mm. ; in Ökpörö Eyop 2–3 mm. ; in Abe-funtum or Abe-tuntum, 3 mm .; in Kissede 3–5 mm. ; Dé and Dihôhó 4–4·25 mm.

The position of the White Oil Palm of the Gold Coast, Abe-fita, seems somewhat doubtful, and it seems possible that, owing to the character of its oil, &c., it may represent a distinct variety. The endocarp is from 2·25–3 mm. thick.

(2.) **The King Palm**, or Abe-Ohene of the Gold Coast, has already been referred to under Southern Nigeria, where it appears to have its home. In the Eastern Province it bears the names, Afia Okpö Eyop, Af-fiako-jub (Efik), Efiako Eyop (Ibibio), Ojina, Ojuku

* These two forms, however, shew a very high percentage of oil, *see* p. 40.

(Ibo). In the Central Province it is known as Ogedudin, Ogiedi (Beni), and it is the Ope-Ifa of the Yorubas. In Dahomey where it is known as "Palmier fétiche" it bears the native names Fadé or Agoudé and in Togoland it is known as Agadé, Agodé and Klude.

From the reports it seems likely that this plant will prove to be a distinct species, or at least, a well marked variety, but it is unfortunate that the specimen received at Kew does not show the characteristics which have been ascribed to it (*see* pp. 35, 42), so that at present no satisfactory conclusion can be reached. It is regarded as a sacred tree, and is used for medicine. The leaves with their fused segments appear to be a very distinctive character of this rare variety and this is well seen in the illustrations given by M. J. Adam. The trunk of the tree also seems to present a different appearance from that of the common variety.

The fruit and nuts of Efia Ekpo Eyop and Ogiedi or Ope-Ifa are figured (Figs. 8–11). In the former specimens the shells of the "nuts" are about 4·5 mm. in thickness, and in the latter from 4–5 mm. in thickness. In this respect they are very similar to the "nuts" of Welwitsch's var. *macrosperma*, from Angola, which bears the native name of Dihôhó. From his description, however, it seems that this form is probably a variety of the typical Oil Palm, and does not represent the King palm.

The Ope-Ifa, according to the report by the Conservator of Forests, Southern Nigeria, is distinguished by having "4 or more 'eyes' . . . . instead of the three ordinarily found in the typical species." Unfortunately, owing to the lack of material, it is not possible to estimate the value of this character. In the few nuts of the Ope-Ifa, sent from Benin city, the four pores in the endocarp are well seen (Fig. 11), but, on the other hand, specimens of Abe-tuntum, from the Gold Coast, have also been observed with four pores, and, judging from what obtains in other palms, the number of pores in the endocarp appears to be a character of very doubtful systematic value.

(3.) **The thin-shelled variety** of the Oil Palm has proved to be well known in the Gold Coast, Dahomey, Togoland, Southern Nigeria, the Cameroons and Angola.

From the evidence afforded by the character of the fruits and seeds, it appears then that the thin-shelled form of *Elaeis guineensis* is the var. *microsperma*, Welw. (Figs. 4 and 5).

In the Flora of Tropical Africa, viii, p. 125, this variety is upheld, and there seems sufficient evidence to justify the retention of the name var. *microsperma* for the thin-shelled variety of the Oil Palm. From the various reports it appears that the fruits afford the only means by which this variety can be distinguished. It is known by the following native names :—

Elaeis guineensis, Jacq. var. *microsperma*, Welw., Disombo (Angola) Lisombe, Isombe (Cameroons) Asoge jub, Ösök Eyop (Efik) (Fig. 6) Osuka, Ausuku (Ibo) Eduege Eyop (Ibibio) Ivioronmila (Benin) Ope Arunfo (Yoruba) Dé-de-bakui, Dechla (Togoland) Degbakou (Dahomey) Abobo-be (Gold Coast) (Figs. 1–3).

The variety Votchi from Dahomey, in which the shell is reduced to a felt of fibres, may possibly be the same as the Digumbé of Angola, and both these forms are probably variants of the thin-shelled variety.

The form sent from Old Calabar under the name Mbana Eyop differs somewhat from all the others in its smaller flask-shaped fruits. The endocarp is from 1·25–1·75 mm. in thickness.

The oils from the fruits of many of these various forms are under examination at the Imperial Institute, and further light may be shed on the subject as the result of their analyses.

Reproduction of the varieties of the Oil Palm from Seed:—It has already been noticed that Mr. Evans in his letter of August 19th, 1908, to the Director of Kew expresses a doubt as to whether the thin-shelled variety comes true from seed, and a similar doubt is expressed in M. Adam's account of the thin-shelled forms of Dahomey and in Dr. Gruner's account of the Klude variety of the Oil Palm in Togoland.

Dr. Strunk has also clearly shewn that in the small experimental plantation at Victoria, Cameroons, the Lisombe variety did not come true from seed. It cannot be held, however, that this experiment or the native reports disprove the stability of any given variety of the Oil Palm without further careful evidence.

The suggestion that seedling palms may only show the characters of their parents after some years of growth does not seem highly probable,* but it does appear likely, especially since the varieties grow interningled, that cross fertilization may occur between the different forms.

The Victoria experiment is unfortunately on too small a scale to be of any great value, though the results, so far obtained, lend some colour to the suggestion that the seed used was of a hybrid nature.

From the foregoing facts it is clear that careful experimental work should be undertaken before any extensive sowings of the seed of a particular variety of the Oil Palm are made.

Experiments should be on the following lines and careful records should be kept.

(1.) Experimental plots of as many varieties as possible should be sown under the most favourable conditions and a sample of the seed sown in each case should be kept for future comparison.

(2.) Female inflorescences should be fertilized by male inflorescences from the same tree. This should be done with a few well marked varieties and with more than one individual of each variety. Care would have to be taken to prevent cross fertilization. The seeds produced should be sown in experimental plots.

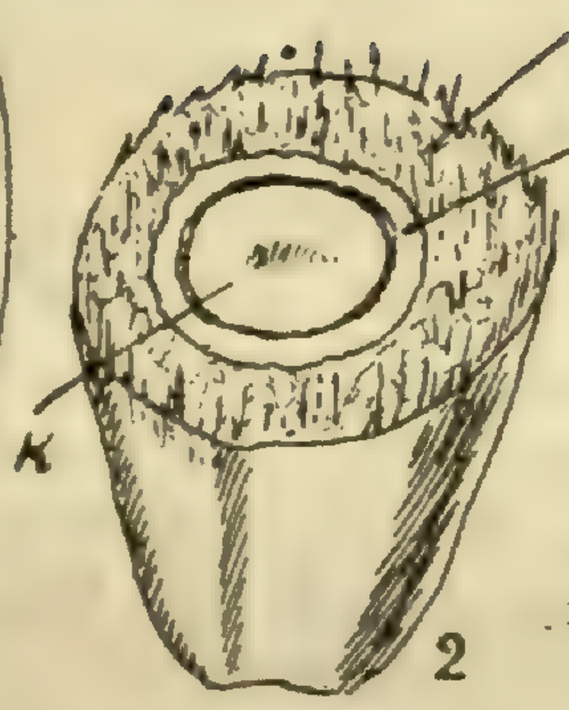
(3.) Experimental plots might also be made on poor soil for comparison with those on good ground.

Observations and careful records are also required as to the character of the fruits borne by the same individuals of definite varieties over a period of years together with information as to the conditions of situation, moisture, &c. From such data it should be possible to discover whether any fluctuation occurs in the general characters of the fruit, in different seasons.

---

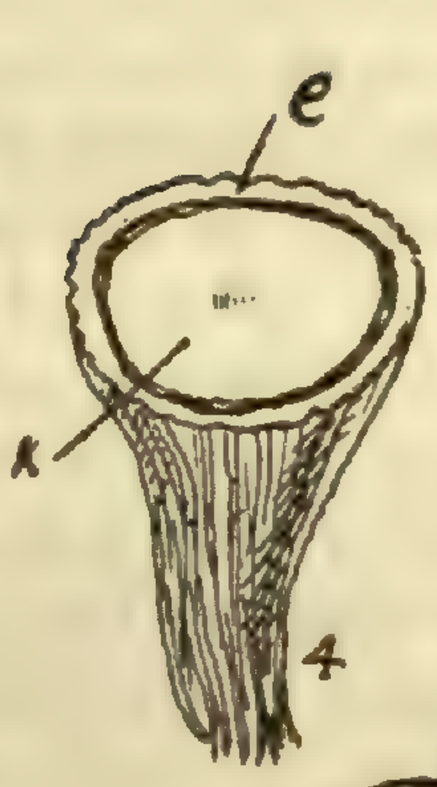
* The different characteristics of the three kinds of palm are in my opinion not accidental or due to variation of environment such as soil, situation, surrounding vegetation, rainfall or atmospheric humidity, because I have seen the three kinds growing in contiguity in very sandy loam under identically the same conditions, which clearly demonstrates that the differences are inherent not extrinsic. (Hitchens, Eastern Prov. S. Nigeria, *see* p. 37.)

1



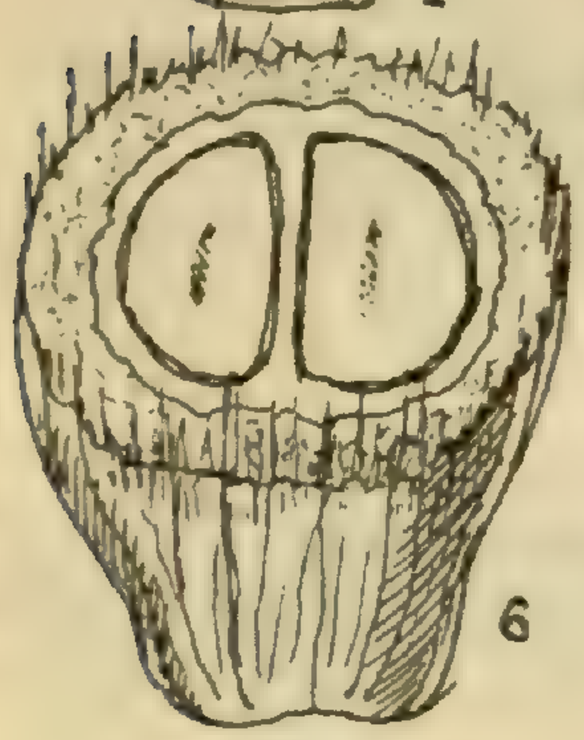
2

3

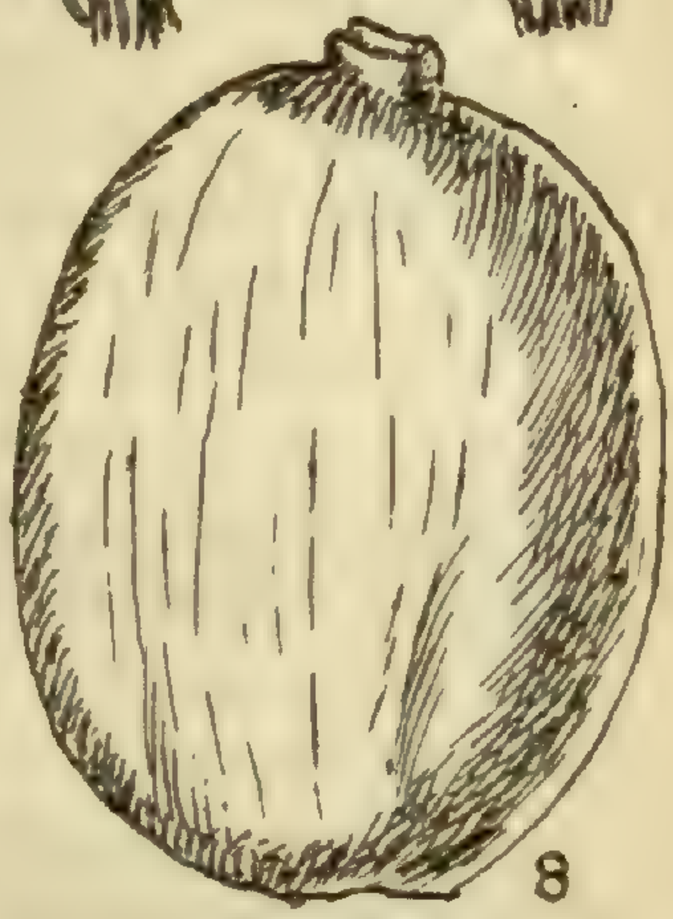


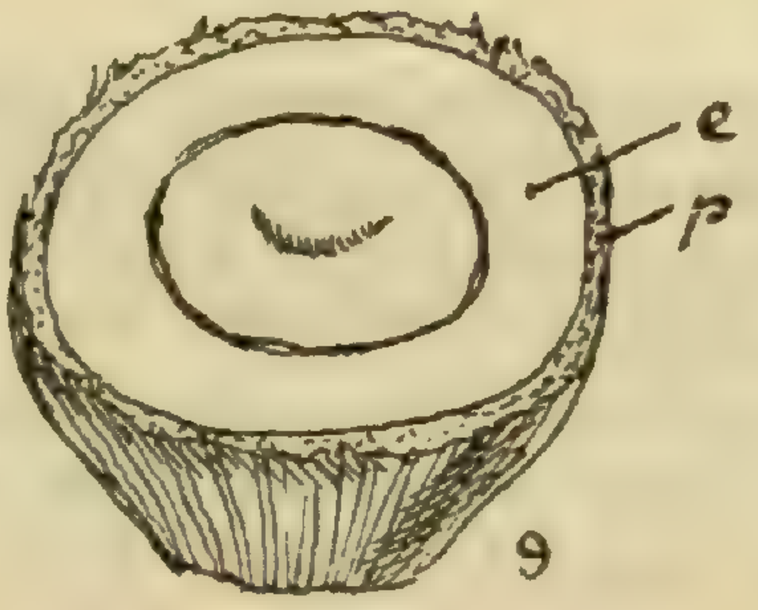
4

5


6

7

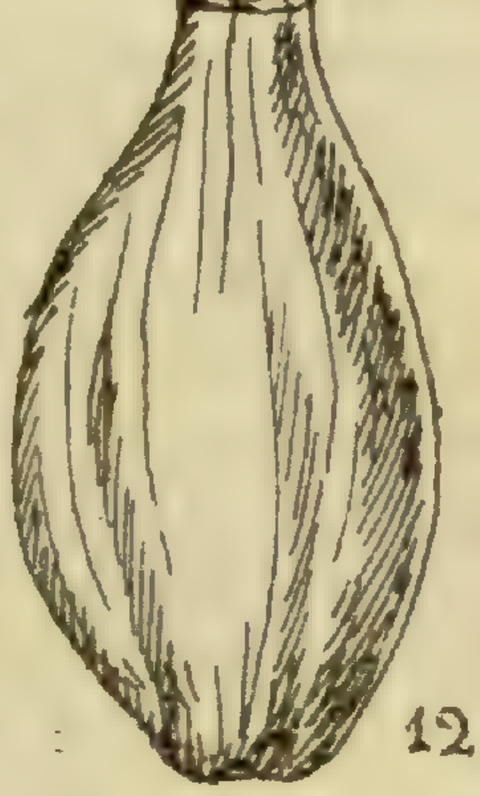

8

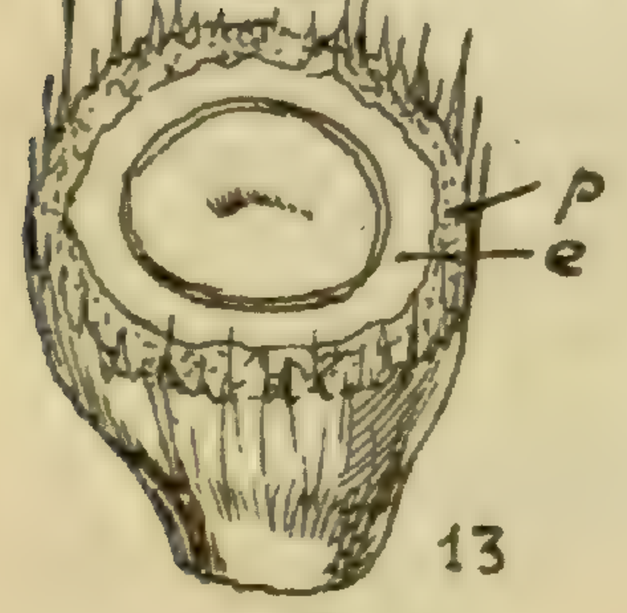


9

10

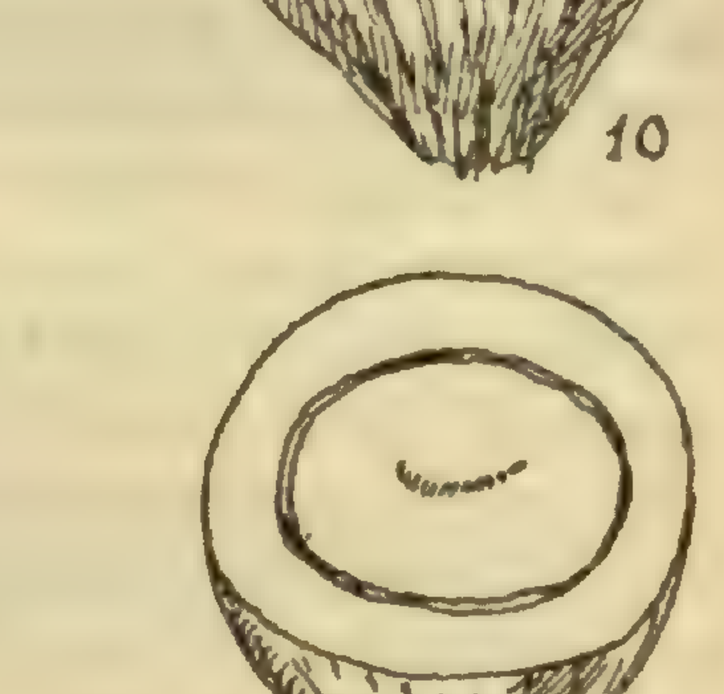
11


12

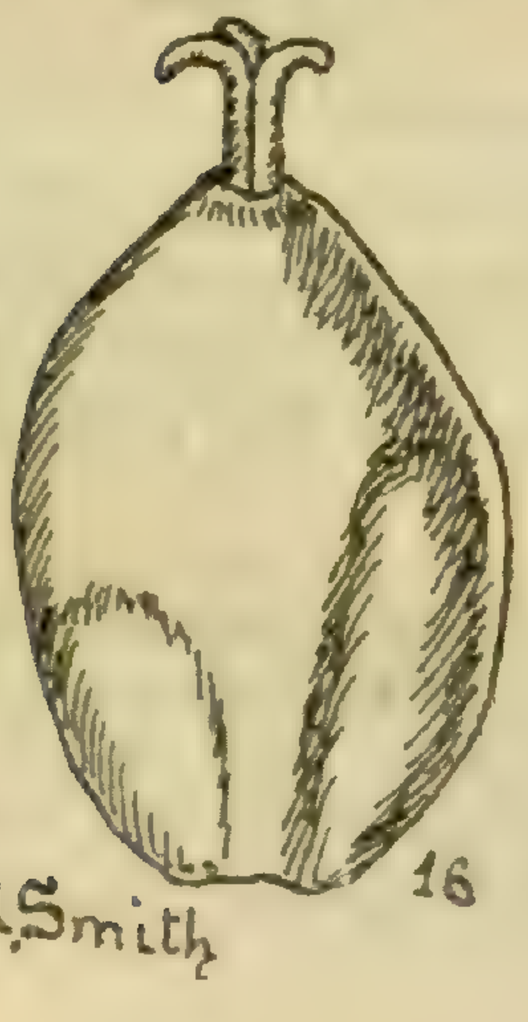


13

14



15


16

17

M. Smith

Explanation of Figures.

All natural size.

Fig. 1. Abobo-be, (Gold Coast). The fruit.
„ 2. Abobo-be. The fruit in transverse section shewing the outer oily pericarp (p), the thin stony endocarp (e) about 1 mm. thick, and the kernel (k).
„ 3. Abobo-be. The "nut" shewing the 3 apical pores of the endocarp.
„ 4. Disombo, (Angola). *E. guineensis*, Jacq. var. *microsperma*, Welw.; the nut in transverse section shewing the thin endocarp and kernel.
„ 5. Disombo. The same in longitudinal section.
„ 6. Ösök Eyop, (Old Calabar). The fruit in transverse section showing twin kernels within the endocarp.
„ 7. Ökpörö Eyop, (Old Calabar). The fruit in transverse section; the stony endocarp is 2–3 mm. in thickness.
„ 8. Afia Ökpö Eyop, (Old Calabar). The whole fruit.
„ 9. Afia Ökpö Eyop. The same in section, shewing a thin outer pericarp and an endocarp about 4·5 mm. in thickness.
„ 10. The same, a nut shewing 3 apical pores.
„ 11. Ogiedi or Ope Ifa, (Benin). A nut shewing 4 apical pores said to be typical of this variety.
„ 12. Mbana Eyop, (Old Calabar). The whole fruit, which is flask-shaped and smaller than that of other varieties.
„ 13. Mbana Eyop. The fruit in section; the outer pericarp is thin and the endocarp measures from 1·25–1·75 mm. in diameter.
„ 14. Abe-funtum, (Gold Coast). The nut in transverse section; the endocarp is about 3 mm. thick.
„ 15. Abe-pa, (Gold Coast). The nut in transverse section; the endocarp is from 3–4 mm. in thickness.
„ 16. Abe-fufu or Abe-fita, (Gold Coast). The fruit shewing the style and stigma.
„ 17. Abe-fufu. The same in transverse section; the endocarp is from 2·25–3 mm. in thickness.

VII.—DIAGNOSES AFRICANAE: XXVII.

1001. **Sebaea pusilla**, *Eckl.*, var. **major**, *A. W. Hill.*

Caulis 8–12 cm. altus, superne ramosus. *Folia* elliptico-ovata vel linearia, acuta, 6–8 mm. longa, 2–3 mm. lata. *Flores* in cymas 1–3-floras dispositi. *Calyx* 4–5 mm. longus, segmentis lanceolatis carinatis. *Corollae* tubus 8–9 mm. longus; lobi 3 mm. longi, 1·25–2 mm. lati obovati, subacuti. *Filamenta* 2·5–3 mm. longa, sub apicem abrupte inflexa. *Stylus* 4 mm. longus, stigmate capitato.

Cape Colony. Clanwilliam Div.; banks of Oliphants river behind Clanwilliam, muddy soil, common, *Leipoldt*, 654! in Herb. Albany Mus. Grahamstown.

According to the collector's label the flowers are said to be blue. There is no other record of blue flowers in the genus, and it seems probable that there is some error in the label.

1002. **Exochaenium exiguum**, *A. W. Hill* [Gentianaceae-Exaceae]; species ex affinitate *E. chionanthi*, Schinz et *E. Baumiani*, Schinz sed forma parviore, foliis lineari-lanceolatis, antherisque praesertim differt.

Annua erecta. *Caulis* 6–8 cm. altus, simplex vel superne ramosus. *Folia* opposita, per paria 4–6, lineari-lanceolata, acuta 2–12 mm. longa. *Flores* solitarii longe pedunculati. *Calyx* 8 mm. longus, segmentis anguste ellipticis, acuminatis, anguste alatis. *Corollae* tubus 9 mm. longus; lobi 2·5 mm. longi, 1–1·25 mm. lati, obovati, acuminati. *Filamenta* 1 mm. longa, supra basin tubi 4 mm. inserta; antherae ·75 mm. longae, curvatae, liberae, 3-glandulosae, apice glandulis fusiformis ·5 mm. longis, basi glandulis minutis instructae. *Stylus* 2 mm. longus; stigmate 1·5–1·75 mm. longo clavato papilloso inter antheras disposito.

Rhodesia. Buluwayo, *Eyles and Johnson*, 1032! in Herb. Albany Mus. Grahamstown.

The roots in this plant are short and thick and are evidently provided with a mycorrhiza.

The species appears to be allied to *E. chionanthum* and *E. Baumianum*, in which however the lower leaves are ovate-oblong and the whole plant is much larger.

1003. **Salsola congesta**, *N. E. Brown* [Chenopodiaceae]; affinis *S. foetidae*, Del., sed habitu, cortice cinereo, nec albido, ramulis aphyllis subspinescentibus subhorizontaliter patentibus et ramulis foliiferis fasciculatis facile distinguitur.

Frutex lignosus, cortice cinereo. *Ramuli* aphylli, subspinescentes, subhorizontaliter patentes; ramuli foliiferi fasciculati, congesti, 0·5–3 cm. longi, minute tomentosi. *Folia* minuta, conferta, sessilia, imbricata, 1 mm. longa, late ovata, obtusa, crassa vel turgida, marginibus hyalinis submembranaceis, adpresse cano-pubescentia. *Flores* minuti, sessiles. *Sepala* 5, elliptica, obtusa, latissime hyalino-marginata, prope apicem plus minusve ciliata, in fructu alis membranaceis albis inaequalibus late cuneatis, apice subrotundatis suberosulis 1·5–1·75 mm. longis 1·5–2·5 mm. latis instructa.

British Somaliland. *Drake-Brockman*, 446, 447.

1004. **Salsola somalensis**, *N. E. Brown* [Chenopodiaceae]; affinis *S. Bottae*, Jaub. & Spach, sed ramis cortice cinereo, ramulis viridibus leviter corrugatis (nec atratis et laevibus) acutioribus, foliis minoribus et fructus alis pallidissime brunneis nec fuscis differt.

Frutex lignosus, ramosissimus, glaber. *Rami* cortice cinereo; ramuli patentes, recti, subaphylli, apice acuti vel subspinescentes, virides, longitudinaliter corrugati, 0·6–1·5 mm. crassi. *Folia* minuta, squamiformia, alterna, distantia, patentia, 0·5–1 mm. longa, ovata, acuta. *Flores* non vidi, bibracteati. *Bracteae* 1·25 mm. longae et latae, latissime ovatae, acutae vel obtusae, subscariosae. *Fructus* sessilis, orbiculatim alatus, 8–10 mm. diam., pallidissime brunneus; alae 5, membranaceae, imbricatae, latissime cuneatae, apice rotundatae, integrae.

British Somaliland, *Drake-Brockman*, 484.

1005. **Pycnocoma hirsuta**, *Prain* [Euphorbiaceae - Crotoneae]; species foliis subtus hirsutis, stigmatibus apice haud dilatatis, receptaculo carunculato insignis.

Frutex 2–4-metralis, ramulis ferrugineo-tomentosis. *Folia* brevissime petiolata, oblanceolata vel anguste oblonga, apice acuminata, margine argute serrata, basi longe attenuata, chartacea, supra glabra, subtus praesertim secus nervos pilis patentibus hirsuta; nervi secundarii 12–18-jugi; lamina 20–30 cm. longa, 5–8 cm. lata; petiolus 5 mm. longus. *Racemi* laterales in axillis summis tantum, 5–15 cm. longi; rhachis gracilis pubescens; bracteae patentes, ovatae, acutae. ♂ *Sepala* 4, reflexa, ovato-lanceolata, 5 mm. longa, extra hirsuta. *Stamina* indefinita, exserta; filamenta 6 mm. longa; receptaculum in carunculas inter stamina dispersas segregatum. *Ovarii rudimentum* 0. ♀ *Sepala* 5, anguste ovata, acuta, extra hirsuta, 4 mm. longa. *Ovarium* pubescens, 3-lobum, lobis exappendiculatis; styli triente inferiore connati, supra recurvi, stigmatibus linearibus haud dilatatis.

Tropical Africa. Nile Land; Uganda, Mabira Forest, *Dawe*, 202; *Ussher*, 62; *Bagshawe*.

As regards stigma this differs from the other continental African species and accords with the characters assigned to those which occur in the Mascarene Islands. It however differs from these latter in having a receptacle which is glabrous as in the continental species. The receptacle, however, in place of being a concrete body with pits in which the stamens are inserted is broken up into a congeries of caruncle-like bodies interspersed among the filaments.

1006. **Tragia** [**Tagira**] **Brouniana**, *Prain* [Euphorbiaceae-Crotoneae]; species *T. cannabinae*, Linn. f., affinis, differt tamen statura humiliore, calycis foeminei segmentis lateralibus pluribus, angustioribus, foliorum segmentis angustioribus.

Herba perennis; caulis erectus simplex, setosus, 10–15 cm. altus. *Folia* breve petiolata, ad basin fere 3-partita, 5 cm. longa, segmentis lanceolatis inaequaliter dentatis; lobus centralis 8–9 mm. latus, laterales 1·25 cm. longi, 3–4 mm. lati; omnes firmuli, supra fere glabri; subtus pallidiores, pubescentes, setis paucis additis; petiolus 3–6 mm. longus, setosus; stipuli lanceolati, erecti. *Racemi* terminales, 2·5 cm. longi; bracteae anguste lanceolatae; rhachis dense setosa. *Flores masculi* pauci, breve pedicellati. *Sepala* 3. *Stamina* 3. *Ovarii rudimentum* minutum, 3-fidum. *Flores foeminei* basales. *Sepala* 6, pinnatifida, rhachi oblonga vel anguste oblonga; laciniae 3 terminales subaequales, ceteris lateralibus utrinque 6–7 dense ciliato-setosis longiores. *Ovarium* dense setosum. *Capsula* 3-cocca, setis rigidis albidis obsita, 6 mm. longa. *Semina* globosa, fusca, 3 mm. lata.

Tropical Africa. Nile land; Sennar; Sauleil, *A. F. & H. M. Broun*, 775.

1007. **Tragia** (**Tagira**) **gallabatensis**, *Prain* [Euphorbiaceae-Crotoneae]; species *T. Hildebrandtii*, Muell.-Arg., habitu foliisque proxime accedens, differt tamen foliis alte tripartitis sepalisque floris foeminei multo latioribus.

Suffrutex, ramis erectis setis rigidis pungentibus parce indutis nec tamen pubescentibus. *Folia* breviter petiolata, alte palmatim

3-partita, membranacea, pallidiore viridia, setis perpaucis secus nervos medianos induta ceterum utrinque glaberrima ; lobi lanceolati, acuti, integri vel parce grosse-dentati, centralis 10–12 cm. longus, 1·5 cm. latus, laterales 6–8 cm. longi, ·75–1 cm. lati ; petioli 3–6 mm. longi ; stipulae parce setosae, lanceolatae, reflexae, 8–10 mm. longae. *Racemi* oppositifolii vel terminales, longe pedunculati, 10 cm. longi, parte florifera 4 cm. longa, pedunculo nudo setoso 6 cm. longo ; bracteae lanceolatae, parce setosae, 1-florae. *Flores* ♂ pedicellati, pedicellis parce setosis, 2 mm. longis. *Sepala* 3, ovata, acuminata. *Stamina* 3. *Ovarii rudimentum* 3-lobum, centrale, majusculum. *Flores* ♀ basales, saepius 2. *Sepala* 6, fructigera demum 9–12 mm. longa, alterna 3 parte centrali late oblanceolata 8 mm. lata, 3 parte centrali anguste oblonga 6 mm. lata, omina utrinque parce pubescens, margineque pinnatim laciniata, laciniis utrinque 6, lanceolatis, suberectis, extra dense setosis, intus glabris. *T. tripartita*, Schweinf. Pl. Gallab. Exsicc. n. 923 [nomen] nec Beille.

Tropical Africa. Nile land ; Gallabat ; Matamma, *Schweinfurth*, 923.

1008. **Tragia (Tagira) impedita**, *Prain* [Euphorbiaceae-Crotoneae] ; species *T. angolensi*, Muell.-Arg., quam maxime affinis, petiolis longioribus bracteisque florum masculorum brevioribus facilius distinguenda.

Caulis erectus, ramosus, 60 cm. altus, cortice pallido innovationibusque glabrescentibus. *Folia* manifeste petiolata, ovata, acuta, argute serrata, basi integro rotundata vel truncata, 4 cm. longa, 2 cm. lata, membranacea, supra glabra, subtus secus nervos parce hispida, ceterum glabra ; petioli puberuli et parce hispidi, 1·25 cm. longi ; stipulae late lanceolatae, erectae, 3 mm. longae. *Racemi* axillares, densi, breve pedunculati, 2·5 cm. longi, rhachide puberula ; bracteae ovato-lanceolatae, 2 mm. longae, puberulae ; pedicelli 4 mm. longi. *Sepala* floris masculi 3, ovata, acuta, puberula. *Stamina* 3. *Sepala* floris foeminei 6, 3 ambitu orbicularia, 3 alterna ambitu oblonga ; omnia pinnatim laciniata, laminae parte indivisa oblonga, laciniis 13–15 pubescentibus. *Ovarium* parce pubescens ; styli crassi, fere erecti, triente imo connati.

Tropical Africa. Mbuyuni, *Scott Elliot*, 6200.

1009. **Tragia (Tagira) Gardneri**, *Prain* [Euphorbiaceae-Crotoneae] ; species *T. subsessili*, Pax, affinis foliis minoribus ovatis nec subhastatis, bracteis saepissime obtusis, calycis foeminei lobis magis incisis capsulaque setosa differt.

Caulis erectus, ramosissimus, ramulis strictis subpatentibus, 40 cm. altus, parce pubescens pilisque rigidis urentibus plus minusve indutus. *Folia* subsessilia, ovata, acuta, basi truncata vel late cuneata ibique integra, margine basi excepto distincte serrata, 2–2·25 cm. longa, 1 cm. lata, pallide viridia, utrinque parce pubescentia subtusque secus nervos pilis rigidis obsita ; petiolus 1–2 mm. longus, stipulis ovato-lanceolatis, reflexis, 3–4 mm. longis. *Racemi* densi, terminales et oppositifolii, subspicati, 2·5 cm. longi ; pedunculi nudi ad 5 cm. usque longi, puberuli et densius pilis rigidis obsiti ; bracteae anguste ovatae, inferiores acutae, ceterae obtusae fere glabrae. *Flores masculi* breviter pedicellati. *Sepala* 3, ovata.

1

2

3

To face page 53.

Stamina 3–4 perfecta ; staminodia parva 2. *Flores foeminei* 1–2, basales. *Sepala* 3, pinnatipartita, setosa, ambitu orbicularia, demum 6 mm. longa lataque, laminae parte indivisa ovata, laciniis saepissime 13, lanceolatis, brevibus. *Ovarium* pilosum. *Capsula* setosa, 3-cocca, 6 mm. longa. *Semina* globosa, 4 mm. diametro, brunneo-rubra sed pallide marmorata.

RHODESIA. Gwelo, *Gardner*, 34.

1010. **Gladiolus subaphyllus**, *N.E. Br.* [Iridaceae] ; affinis *G. parvulo*, Schltr., sed elatior et subaphyllus cum floribus minoribus differt.

Cormus 1–1·2 cm. diam., tunicis fibrosis vestitus. *Planta juvenilis* unifoliata ; folium 9–12 cm. longum, 2·5–3 mm. latum, lineare, acutum, pilis patentibus laxe piloso-pubescens, marginibus incrassatis. *Planta florifera* subaphylla. *Caulis* 24–36 cm. altus, gracilis, glaber, apice 2–3-florus, vaginis duabus arcte investus cum vaginula 5–6 mm. longa arcte convoluta glabra infra inflorescentiam ; vagina inferior 2–3 cm. longa, oblique truncata, glabra ; vagina superior ad medium caulem attingens, 12–18 cm. longa, laxe patente pubescens, sulcato-striata, apice in acumen appressum subulatum vel lineari-attenuatum compressum acutum liberum 3–6 mm. longum producta. *Bracteae* aequales, 9–11 mm. longae, 4 mm. latae, oblongae vel elliptico-oblongae, subacutae. *Perianthium* infundibulare, 2–2·2 cm. longum, subregulare, album, carneo-tinctum ; tubus 5–6 mm. longus ; segmenta subaequalia, 15–16 mm. longa, 6 mm. lata, lanceolata, acuta. *Stamina* glabra.

NATAL. Zwartkop, at 1,200–1,525 m., *Wood*, 10153.

VIII.—INJURIES TO PLANTS DUE TO HAIL AND FROST.

G. MASSEE.

The injury to foliage and flowers caused by hail is well known ; the fact that an equal, or perhaps greater amount of damage to the bark of trees is due to the same cause, is not so generally realised, the wounds formed being often attributed to frost, insects or fungi. Young trees, or the young branches of older trees suffer most, especially those kinds possessing a smooth bark. The injury caused is greatest during the early summer months, when the trees are in full growth, as at this time the bark is soft and most easily injured by bruising. The accompanying plate illustrates two portions of the branch of a pear tree that was injured by hail during the summer of 1908, and photographed the following January. Towards the lower end of the left hand figure (fig. 1). the injury caused by single hailstones is seen. The upper portion of the same figure illustrates the effect produced by several hailstones striking the branch at points near to each other. The right-hand figure (fig.2) shows the sheltered side of the same branch, which is free from wounds. The injury being confined to one and the same side of a branch, along with the more or less circular form of the isolated wounds, are factors characteristic of injury due to hail. When soft

bark is struck by a hailstone with moderate force, the bark is completely crushed and disorganised at the point of contact, and soon becomes dead and dry, contracting at the same time and breaking away from the surrounding living bark. Owing to this contraction, a fissure is formed separating the dead from the living portion, which too frequently enables the spores of different kinds of parasitic fungi to gain an entrance into the living portion of the branch, and complete its destruction.

It rarely happens in this country, that hailstones do a greater amount of damage to trees than indicated above, but in tropical countries where such storms are very severe, the amount of injury done must be immense. Under such conditions I have seen galvanized iron roofing perforated by hailstones as readily as if it had consisted of paper.

In speaking of the damage done to trees, Hartig says* :—"At places where the hailstones strike the rind is crushed, or it may be knocked off altogether. Although as a rule, a callus very soon forms over such wounds, still it not infrequently happens that the injured portion of the stem dies. In young spruce woods in the neighbourhood of Munich, I found that the leading shoots which were affected by hailstones died—a result doubtless due to the excessive evaporation from the wood, which in many cases was stripped of its cortex on one side of the shoot to the distance of about an inch."

Spring frosts.—These are, with much reason, dreaded by those concerned with the cultivation of plants. Many kinds of plants that survive without injury severe winter frosts, succumb to a comparatively slight frost after growth has commenced. This difference depends on the relative amount of water present in the tissues during different seasons of the year. When active growth commences the leaves and youngest shoots contain a considerable amount of water. During a late spring frost water is abstracted from the cells into the intercellular spaces, more especially under the epidermis of leaves and shoots, where it freezes into parallel prismatic crystals. The withdrawal of water from the cells of a leaf causes it to droop and exhibit the well known symptoms of the effect of frost. The recovery or death of a frozen leaf depends mainly on the precise manner in which thawing takes place. If the process is gradual, allowing the water to be reabsorbed by the cells as it thaws, little or no injury is sustained, whereas if the thaw is sudden, due to bright sunshine early in the day following a sharp frost, the rapidly liberated water floods the intercellular spaces, instead of being absorbed by the cells, and the death of the organ results. When actively growing leaves are frozen late in the spring, the epidermis of the under surface is often completely torn away from the remainder of the leaf, and hangs like a blister. Cabbages are often injured in this manner. The young leaves of evergreens also suffer in a similar way.

Frost cracks.—These are longitudinal cracks of variable length in the bark and wood of tree trunks, and are the result of a great and sudden lowering of the temperature. In this instance water is

*Hartig and Somerville, "Diseases of Trees"; Engl. ed., p. 299 (1894).

withdrawn from the cell-walls, and freezes in the cavities of the cells. Owing to loss of water from the cell walls, the cells shrink, and a crack is the result. When the temperature rises the cell-walls re-absorb the water, causing the cells to expand, and the crack closes more or less. The subsequent formation of callus completes the work of closing the wound. It not infrequently happens that an old frost crack, being a weak point, is reopened by succeeding frosts. As a rule little direct injury results from frost cracks, in the case of our native trees, but they often enable parasitic fungi to gain a foothold. When a frost-crack is completely healed, the callus formed from the two edges of the crack meets and forms a more or less projecting ridge, known as a frost-rib.

Sub-tropical trees often suffer severely from frost when grown in this country, even when not at first killed outright. *Catalpa bignonioides*, Walt., an ornamental tree, a native of the Southern United States is often injured by frost when growing in England or in the New England States. A very fine specimen at Kew, about sixty years old, recently succumbed from the cumulative effect of frost. The tree had two tiers of three more or less horizontal branches each. When the branches of the upper tier were about forty years old, each one was injured by a severe frost-crack throughout its entire length. These wounds never completely healed, as shown in the accompanying photograph (fig. 3), and afterwards no more shoots were produced on these branches, the result being a scarcity of leaves, which resulted in the crown of the tree being literally starved to death, owing to lack of food and water. The lower tier of branches, being sheltered by the upper ones, was perfectly healthy, and carried an abundance of foliage and flowers when the tree was cut down.

Something can be done to protect plants that have been caught by a spring frost. They should be protected by a covering of some kind—sheets, straw, &c.—from the sun's rays, so that they may thaw gently and gradually. When the covering method is impracticable, a thorough spraying with cold water is often effective in preventing rapid thawing.

In the case of frost-cracks or injury caused by hail, the wounded parts should be sprayed with Bordeaux mixture at intervals until a callus is formed.

IX.—LALANG GRASS.

(*Imperata arundinacea*, Cyrill).

J. M. Hillier.

Attention has recently been drawn to this plant as a source of paper-making material. It is a common plant in tropical countries and has been described as a pestilent weed, which once allowed to invade a plantation, can only be eradicated at enormous expense; it is ubiquitous, always one of the first weeds to cover newly opened land, and by far the most difficult to eradicate.

Imperata arundinacea proper has a creeping rootstock with solid stems of 1 to 3 ft. and glabrous or bearded nodes, leaves erect, often

exceeding the stem in length. Distribution : India, Malacca, Ceylon, &c. The variety *latifolia* found in the Tropical Himalaya from Kumaon to Assam is a more robust plant, with stems of 3 to 4 ft., glabrous nodes, and long leaves ½ to ⅔ inch broad.

Of the various methods adopted, or suggested, for the eradication of this grass the following note from the "Ceylon Observer" (1906) may be worth recording :—

"Lalang or Illuk grass, one of the worst of tropical weed pests, which was recently the subject of discussion at the meeting of the Board of Agriculture, is prevalent in Kedah. But a cheap and effective method for ridding the ground of it has been found. Lalang-grown land is let to Chinamen rent free, and a small sum of 10 to 20 rupees given to help the men to start. The Chinese cultivator is a wonderful worker and with the native wooden plough and buffaloes he turns up the soil and tramples under the roots, and then plants tapioca on the cleaned land. In the rows of tapioca, or, between them, the planter puts in his rubber seedlings, which the Chinaman looks after while he tends his tapioca crop, and keeps down the lalang tending to sprout. After the tapioca crop is taken the rubbers are growing up well and the land is perfectly clean. Another method of destroying lalang, we ("Ceylon Observer") were told by two planting visitors from Kedah, was by flooding the land. Water is turned on as if for paddy cultivation, and left on the surface for a couple of months until the lalang has rotted, when it is drained and the land ploughed for planting. Burning is also adopted, but to keep the fire under control, large ditches must be dug to prevent it spreading beyond bounds. Kedah is one of the native Siamese states in the Malay Peninsula".

The idea of turning this plant to a useful application is not a new one. In the early part of 1894 a correspondent at Singapore forwarded to Kew for report a sample of half-stuff prepared from it. This was submitted to Messrs. John Dickinson & Co., Ltd., Croxley Mills, Watford, who kindly furnished the following report under date March 27th, 1905 :—

"We have tried and tested the sample of lalang grass you sent us. The sample as received consisted of a block of dried fibre and not as the original plant. Further, the percentage of dry fibre obtained from the plant was not stated, so that we are unable to give the percentage of yield obtainable from the original grass. The dried and pressed pulp yielded about 75 per cent. of its weight of bleached fibre, and as a paper-making material seems to occupy an intermediate position between Spanish Esparto and good straw fibre. We estimate the value of this Singapore lalang grass, delivered f.o.b. London (in the dried brick form submitted to us), at about £5 10*s.* per ton. The dry uncrushed grass would be equally suitable if in well-pressed packed bales at a price proportionate to the fibre in it. We should be glad to try an experiment with it on a larger scale if we could get four or five tons of the grass."

Various other correspondents have communicated with Kew on the subject of the utilisation of this grass for paper-making, including Messrs. Ide & Christie, the well-known fibre experts, who

have kindly forwarded samples of the grass and a photo-micrograph of a transverse section of the leaf. (*See* Case 93, Museum No. II.)

The following account by Mr. G. Stewart Remington of recent chemical investigations and of experiments made in the manufacture of paper from lalang appeared in the Agricultural Bulletin of the Straits and Federated Malay States, December 1908, p. 585 :—

"One of our correspondents sent a sample of lalang grass recently to England, and has received the following report, also samples of paper made from lalang grass entirely and ½ lalang and ½ cotton :—

Certificate of Analysis.

"Sample of Lalang Grass marked 'Exchange Singapore, Straits Settlements,' on 23rd July, 1908.

"This is to certify that the above sample has been carefully examined with the following results :—

"This grass was forwarded to 'The Aynsome Technical Laboratories' for investigation, that its commercial use as a source of pulp for paper-making might be ascertained.

"The object of the present report is to draw attention to the importance and value of this grass as a pulp-producing material, and to indicate its chief characteristics and economic value.

"The sample was a pale buff colour, lustrous in appearance and of fair strength, of the order *Gramineae*.

"The chemical examination furnished the following results, the percentages other than that of moisture being expressed on the dry material :—

Moisture	13·21
Ash	4·14
Loss on L. Hydrolysis	10·76
Loss on B. Hydrolysis	46·65
Loss on Mercerisation	31·62
Loss on Acid Purification	0·95
Gain on Nitration	21·19
Cellulose	47·41
Length of ultimate fibre	1·20

"The ultimate fibre obtained from this grass is very similar in most respects to Esparto, the yield of bleached fibre being about the same. This is a favourable indication, inasmuch as 'Esparto' is one of the best known and most useful sources of supply to the trade. The fibres as seen under the microscope are short, smooth, cylindrical, fairly uniform in diameter, gradually tapering to rounded extremities ; they also occur together in little bundles. The pulp will be found to contain a number of small cuticular cells which do not however show in the finished paper. The fibres are stained a pale yellow with iodine solution, which fades more rapidly than is usual with coloured pulps.

"The results obtained from the chemical analysis show that the grass is capable of yielding a good quality of cellulose, suitable in every way for the manufacture of paper. Although the grass is very susceptible to the action of dilute alkalis, the final product is exceptionally pure and readily resolved.

"From observations noted during this preliminary examination the following scheme was adopted for the production of the pulp on a larger scale.

Process.

"The available grass in its natural condition weighing 400 grams. (14·1 oz.) was in a clean state, and required little treatment beyond cutting into small pieces ready for boiling. It is usually necessary on a large scale to pass the material through some type of cleaner to remove dirt and adventitious matter. The grass was then thoroughly wetted and soaked until it became soft and pliable. It was placed in a boiler of the spherical type, covered with water and digested with caustic soda corresponding to 15 per cent. on the grass treated for a period of 10 hours under a pressure which was kept constant at four atmospheres; an even temperature about 135° C. being maintained.

"Owing to the quantity of material at our disposal being somewhat limited, it was only possible to conduct one experiment, consequently a good margin in the use of caustic and degree of general treatment was allowed.

"The pulp obtained after washing was of good uniform quality and colour. The yield agreed very closely and was only slightly higher than the preliminary chemical analysis shewed, which indicates complete reaction in the digester.

"The pulp was carefully beaten for about an hour and at the same time bleached, chloride of lime being used for the purpose: 10 parts of dry powder being used per 100 parts of pulp.

"The stuff was taken from the beater and well washed and subsequently a small quantity of loading was gradually added and the whole again beaten for half-an-hour. At this stage of the operation the rosin size was introduced and the decomposition of the soda resinate completed with the calculated quantity of alum. The amount of size used corresponded to 4 per cent. on the dry pulp present, the total time occupied in preparation of the pulp for running on the machine being two hours.

Preparation of Paper.

"No great difficulty was experienced in running the pulp: it retained, however, a considerable quantity of water after passing the suction-boxes, and in consequence it was found necessary to keep the press roll down hard. On a large machine this precaution would not be necessary, as more suction-boxes are available and complete control is assured.

"The paper was passed over nine cylinders at a pressure of about 8 lbs. to the square inch, then through one calender and finally reeled off. In a similar manner a second sample was prepared, using a mixture of half pulp obtained from the lalang grass and half cotton beaten together. The paper obtained from this blend could prove very useful as a high-class wrapping paper, it being stronger and possessing a comparatively high resistance to folding, as will be seen in the following table of physical tests done on the

finished specimens of papers. The paper made from 'all-grass' pulp would, with judicious treatment for improvement of colour, be very suitable for printing purposes.

"The following table of figures was obtained and compiled from tests and analyses made on the air-dried finished papers—

	Pure Lalang.	*Half Lalang,* „ *Cotton.*	
Physical properties—			
Breaking strain (lbs.) ...	8·37	8·88	(way of machine)
Stretch (per cent.) ...	1·03	1·35	
Rubbing test ...	27	151	
Thickness (inches) ...	$\frac{1}{125}$	$\frac{1}{235}$	
Chemical constituents, per cent.—			
Rosin size	2·20	2·43	on the dry paper.
Ash (natural and loading)	3·01	1·94	on the dry paper.
Moisture	10·40	8·68	

"The addition of cotton to the pure lalang fibre has the effect of improving its resistance to crumbling, and also in a lesser degree its tensile strength."

X.—THE SOUTH AFRICAN BAMBOO.

(*Arundinaria tessellata*, Munro.)

Otto Stapf.

The existence of a bamboo in Cape Colony has been known for more than seventy years. It was discovered by Drège on several of the high mountains of the Colony as long ago as 1832, if not 1829. His collections include it from Table Mountain (Queenstown Division), Katberg (Stockenstrom Division), and the Witte Bergen (Aliwal North Division). On his labels he also records it from the Bamboesbergen (Tarka and Molteno Divisions), and other "very high localities on the boundaries of Caffraria." The altitudes given by him show a vertical range from 4,000 to 7,000 feet. According to him, it is very common in damp places in the Witte Bergen, where it grows to a height of 15 to 20 feet, whilst in the drier stations on Table Mountain and in the Bamboesbergen it varies from 5 to 10 feet. Almost simultaneously it was found by Ecklon on Winterberg, to the west of Katberg. Neither of the two collectors observed it in flower or fruit; but, from a certain similarity of the vegetative parts with *Nastus borbonicus*, Gmel., Nees, in his elaboration of the *Gramineae* of South Africa (1841), suggested that it was a *Nastus* and named it *Nastus tessellata*. In 1868, however, Munro in his monograph of the *Bambuseae*, transferred the plant to *Arundinaria* as *A. tessellata*. Although Cooper collected it again in the Maluti Range, Basutoland, in 1861, and, recently, Wood and Schlechter in the Drakensbergen, the flowers remained unknown and the generic position was therefore, to a certain degree, still hypothetical, when the bamboo was more fully described in the *Flora Capensis* in 1900. Last December, however, fine flowering

specimens of the bamboo were received at Kew from Mr. J. M. Wood, Director of the Botanic Garden at Durban, Natal. They had been communicated to him by Mrs. W. Putterill, and were collected on the Drakensbergen, near Harrismith, at an altitude of 5,000 to 7,000 feet.

The examination of the flowering specimens proved that Munro was right in referring the species to *Arundinaria*. A technical description of the inflorescences and flowers is given below, supplementing the description of the vegetative parts in the *Flora Capensis*. vii., p. 748. The species is quite distinct from the common tropical African *A. alpina*, K. Sch., and bears a certain resemblance to the Himalayan *A. spathiflora*, Munro, with which it has the spathaceous inflorescences and strongly tessellate leaves in common. The two-flowered spikelets, however, and also the nature of the glums distinguish it sufficiently. In fact it is impossible to point out any close and evident ally in the genus.

In the Kew Report for 1878, pp. 47, 48, there is a paragraph dealing with the economic value of this bamboo. In 1877, samples of the bamboo which according to Commandant J. H. Bowker "are found mostly on the northern slopes of the high mountain range dividing the east and west watershed of South Africa, and mostly on the most exposed sites" had been sent to Kew by the gentleman mentioned, and as a paragraph extracted from the "Natal Mercury" had gone the round of the English papers and caused enquiries concerning the bamboo, the samples received were submitted to a wholesale merchant dealing with such articles. The report was unfavourable, the conclusions arrived at being that the "South African canes, unless far superior to the samples sent, would have no place in the market in competition with the Chinese." Mr. Bowker himself, however, wrote:—"The bamboos are much used by the natives for spear handles, house-building, fences and gates to sheep-folds, &c. They can be got from 3 feet to 25 feet in length, and in any quantity. I have used a rod made from it for many years past and found it superior in spring and strength to any other I could get. I think they could be turned to account as coach-whip handles, umbrella handles, walking sticks, &c.; the root grows into almost every shape, and could be cut into handles of different patterns." From this it appears probable that the samples submitted to the expert were of inferior quality. Nothing more was heard about the use or usefulness of the bamboo; but it seems quite worth while to try again whether it could not be put to any practical use the more so as one of its principal stations, the one near the Van Reenen Pass in the Drakensbergen is now easily accessible by railway. At the same time an attempt should be made to take it into cultivation. It ought to prove hardy in this country.

The area of *Arundinaria tessellata* lies from Stockenstrom and Queenstown Divisions over Craddock, Tarka, Molteno, Aliwal North and Basutoland to the Drakensbergen, the easternmost station in that range being at the Van Reenens Pass. It may be pointed out in this connection that Munro in putting the lower limit of *Arundinaria tessellata* at 500 feet merely repeated a mistake or misprint in Nees's account of the bamboo, where it is said to occur on Katberg at 500 feet, instead of 5,000 feet. The

Bamboesbergen, referred to by Drège, are an extensive range of mountains along the boundaries of Molteno Division in the north and Craddock, Tarka and Queenstown Divisions in the south. There is another "Bamboesberg" to the west of Tarkastad and near the Tarka-Craddock boundary. It also has its name presumably from the occurrence of the same bamboo, in which case this mountain would mark the south-western limit of the area of *Arundinaria tessellata*.

DESCRIPTIO :—*Frutex* interdum arborescens, 1·5–6 m. altus ; culmi basi ultra 8 mm. diametro, fistulosi—uti rami foliati graciles approximati—teretes, laevissimi, ramorum internodiis raro 5 cm. excedentibus. *Vaginae* ad ramorum bases ortae, laminis destitutae, scariosae vel subscariosae, striatae, laeves, caeterae coriaceae, arctae, leviter striatae, praeter margines exteriores superne ciliatos et ora fugaciter fimbriata glabrae ; ligulae obtusae, plerumque breves, rarius ad 4 mm. productae ; laminae perfectae 3–4, versus ramulorum apices approximatae, lanceolatae vel linearilanceolatae e basi attenuata vel rotundata, breviter acutae vel longe in acumen tenuissimum productae, 6–12 cm. longae, 9–14 mm. latae, coriaceae, interdum subglaucae, ad basin parcissime pubescentes, ad margines spinuloso-ciliolatae (juniores quidem), caeterum glaberrimae, nervis lateralibus primariis utrinque 3 (rarius 4), ob venas transversas approximatas et distinctas plerumque eximie tenuiterque tessellatae. *Racemi* breves, circiter 4–5-spiculati in ramis florentibus undique ex axillis foliorum emortuorum ortis vaginis albido-stramineis emarcidis angustis superne longe attenuatis eos saepe paulo superantibus suffulti, cum vaginis foliorum annotinorum in amplam paniculam spuriam dispositi. *Spiculae* praeter imas interdum bractea racemum aequante suffultas ebracteatae, breviter pedicellatae, 16–18 mm. longae, 2-florae ; rhachilla producta, glabra, anthoecium imperfectum gerens. *Glumae* aequales, lanceolatae, acuminatae, 12–13 mm. longae, utrinque 5-nerves, venis transversis nonnullis. *Valvae* a latere visae suboblique lanceolatae, subacuminatae, 14–15 mm. longae, virescentes, nervis utrinque 4–5, venis transversis numerosis conspicuis. *Paleae* 11–13 mm. longae, carinis superne asperis, nervis extracarinalibus utrinque 2–3, venis transversis tenuissimis nonnullis. *Lodiculae* 3 obovato-ellipticae, ciliatae, 2 mm. longae, postica paulo minor. *Stamina* 3 ; antherae 8 mm. longae.

XI.—NEW ORCHIDS : DECADE 33.

321. **Octomeria arcuata**, *Rolfe* ; habitu *O. sarcophyllae*, Rodr., sed foliis latioribus sordide purpureis, floribus flavescentibus et labello trilobo purpureo-maculato differt.

Herba caespitosa, 8–13 cm. alta. *Caules* subgraciles, 3–5 cm. longi, vaginis membranaceis vestiti. *Folia* subsessilia, lanceolata, acuta vel acuminata, subrecurva, crassiuscula, canaliculata, 6–9 cm. longa, 1–1·5 cm. lata. *Flores* solitarii, subpenduli, 1 cm. longi. *Pedicelli* 5 mm. longi. *Sepala* et *petala* oblonga, obtusa, subincurva, 1 cm. longa. *Labellum* trilobum, 7 mm. longum, recurvum ;

lobi laterales erecti, late oblongi, obtusi, 2 mm. lati ; lobus intermedius late triangulari-ovatus, obtusus, recurvus ; discus bicarinatus. *Columna* incurva, 5 mm. longa.

Brazil.

Imported by Messrs. Sander & Sons, and flowered at Kew in November, 1908. The flowers are light yellow, with the keels and side lobes of the lip and the column dark red-purple. The leaves, on reaching maturity, assume a dull purple-brown colour on both surfaces.

322. **Oberonia umbraticola**, *Rolfe* ; ab *O. pachyrachi*, Reichb. f., spicis gracilioribus, floribus majoribus et labello sepalis lateralibus majore differt.

Herba acaulis, 5–6 cm. alta. *Folia* ensiformia, subacuta, 3–8 cm. longa, 8–13 mm. lata. *Scapi* foliis paullo longiores, ancipites ; spicae cylindricae, densiflorae, 3–5 cm. longae, 3–4 mm. latae. *Bracteae* late ovatae, obtusae, denticulatae, circa 0·5 mm. longae. *Flores* brevissime pedicellati, minuti, aurantiaci. *Sepala* ovata, subobtusa, circa 0·75 mm. longa ; posticum reflexum, planum ; lateralia patentia, concava. *Petala* lineari-oblonga, obtusa, reflexa, circa 0·75 mm. longa. *Labellum* integrum vel minutissime crenulatum, ellipticum, obtusum, concavum, 1 mm. longum. *Columna* brevissima.

Siam. Doi Govtep, in very shady jungle, at 1,200 m. alt., *Dr. Arthur Kerr*, 208.

Sent for determination from the Trinity College Botanic Garden, Dublin, by Dr. H. H. Dixon, in November, 1908. It is very near to the Himalayan *O. pachyrachis*, Reichb. f., and at first sight not easy to distinguish from it, but when the excessively minute flowers are boiled up and examined side by side, they present such differences as warrant their separation, for the Siamese plant has not only larger flowers, but a relatively much larger lip.

323. **Bulbophyllum (Cirrhopetalum) campanulatum**, *Rolfe* ; a *B. aurato*, Reichb. f., sepalis lateralibus brevioribus et connatis et petalis non falcato-aristatis differt.

Pseudobulbi subapproximati, ovoideo-oblongi, obscure tetragoni, 2–2·5 cm. longi, monophylli. *Folia* oblonga, obtusa, coriacea, concava (an semper ?), 8–9 cm. longa, circa 2 cm. lata, subtus purpurea. *Scapi* graciles, suberecti, circa 8 cm. longi, apice decurvi, circa 10-flori. *Flores* umbellati, radiati, recurvi, in inflorescentias subcampanulatas dispositi. *Bracteae* subulato-lanceolatae, recurvae, 4–5 mm. longae. *Pedicelli* 5 mm. longi. *Sepalum* posticum elliptico-ovatum, acuminatum, longe ciliatum, concavum, 6 mm. longum ; sepala lateralia connata, decurva, limbus oblongus, subacutus, convexus, apice subrecurvus, 1·5 cm. longus, 8 mm. latus. *Petala* ovata, subacuta vel apiculata, ciliata, 4–5 mm. longa. *Labellum* recurvum, carnosum, oblongum, subacutum, 3–4 mm. longum. *Columna* lata, 3 mm. longa ; stelidia obtusa vel truncata.

Sumatra.

Flowered at Kew in October, 1908, the plant having been sent from the Brussels Botanic Garden. It is a very elegant little plant, the strongly decurved united lateral sepals just meeting at their margins, giving the inflorescence a broadly campanulate shape, in allusion to which the name is given. The dorsal sepal and petals are

very pale whitish yellow, the former with five, the latter with three dull purple stripes, while the fringes are also dull purple. The lateral sepals are pale pink with innumerable darker dots, and the lip dull reddish purple. The flowers are smaller than in *B. auratum*, Reichb. f., and markedly different in shape.

324. **Eria (Eriura) solomonensis**, *Rolfe*; ab *E. Kingii*, F. Muell., pseudobulbis tetraphyllis, et labello integro distincta.

Pseudobulbus ovoideo-oblongus, erectus, circa 13 cm. altus, basi vaginis ovoidea-lanceolatis amplis vestitus, apice tetraphyllus. *Folia* elongato-lanceolata, acuta vel acuminata, basi attenuata, circa 9-nervia, subcoriacea, circa 30–35 cm. longa, 2–3 cm. lata. *Scapi* suberecti, graciles, circa 25–30 cm. longi, pubescentes; racemi multiflori, sublaxiflori. *Bracteae* oblongo-lanceolatae, acutae, parce pubescentes, 5 mm. longae. *Pedicelli* graciles, pubescentes, 1–1·3 cm. longi. *Flores* pubescentes, "albi." *Sepala* oblongo-lanceolata, acuta, 3-nervia, 8 mm. longa; lateralia paullo latiora; mentum conicum, obtusum, 4 mm. longum. *Petala* lanceolata, acuta, trinervia, 8 mm. longa. *Labellum* integrum, late oblongum, subobtusum, undulatum, tricarinatum, 7 mm. longum. *Columna* lata, 2 mm. longa.

Solomon Islands. *Charles M. Woodford*, 11.

Said to be a common species, but quite distinct from *E. Kingii*, F. Muell., the other Solomon Island species. It is allied to *E. profusa*, Lindl., a species of doubtful origin.

325. **Polystachya stricta**, *Rolfe;* affinis *P. Rivae*, Schweinf., sed inflorescentiis longe et stricte paniculatis, petalis et labelli lobis lateralibus angustioribus facile distinguenda.

Pseudobulbi caespitosi, oblongi vel subelongati, 4–8 cm. longi, diphylli. *Folia* oblonga, subobtusa, coriacea, 7–12 cm. longa, 1·5–2 cm. lata. *Panicula* erecta, stricta, 22 cm. longa; ramuli 2–2·5 cm. longi, puberuli. *Bracteae* triangulari-oblongae, acutae, 4–6 mm. longae. *Pedicelli* 4 mm. longi. *Sepalum* posticum oblongum, apiculatum, 8 mm. longum; sepala lateralia oblique triangularia, acuta, 1 cm. longa. *Petala* spathulato-lanceolata, apiculata, 8 mm. longa. *Labellum* 8 mm. longum, trilobum, curvatum, intus pubescens; lobi laterales erecti, late oblongi, obtusi; lobus intermedius ovatus, acutus, subrecurvus; callus tumidus, obtusus, infra medium disci situs. *Columna* lata, 2 mm. longa. *Mentum* latum, obtusum, 6 mm. longum.

British East Africa.

Flowered in the Cambridge Botanic Garden, in August, 1903, when it was sent to Kew for determination by Mr. R. I. Lynch. The flowers are light greenish yellow, with a few faint purple streaks on the base and side lobes of the lip.

326. **Cycnoches densiflorum**, *Rolfe*; a *C. Rossiano*, Rolfe, racemis masculis multo brevioribus et densifloris diversum.

Pseudobulbi erecti, teretes, circa 15 cm. longi, vaginis membranaceis vestiti. *Folia* oblongo-lanceolata, acuta vel acuminata, recurva, subundulata, circa 12–16 cm. longa, 3–4 cm. lata. *Flores* monoici. *Racemi* masculi penduli, multiflori, densiflori, circa 35 cm. longi. *Bracteae* lanceolatae, acuminatae, membranaceae, circa 1 cm. longae. *Pedicelli* graciles, circa 2 cm. longi. *Sepala* et *petala*

membranacea, oblongo-lanceolata, subacuta, recurva, viridia, purpureo-maculata, 2–2·5 cm. longa. *Labellum* unguiculatum, circa 1·5 cm. longum; lamina cochlearis, apice longe acuminata, margine digitis clavatis vel capitatis utrinque instructo. *Columna* gracilis, incurva, 2·5 cm. longa. *Racemi* feminei suberecti, breves, biflori, circa 5 cm. longi. *Bracteae* oblongo-lanceolatae, acutae, circa 1·7 cm. longae. *Pedicelli* crassi, arcuati, circa 4 cm. longi. *Sepala* et *petala* carnosula, patentia, oblonga, acuta, viridia, 3·5–4·5 cm. longa. *Labellum* breviter unguiculatum, ovatum, acutum, integrum, crassocarnosum, eburneum, 3 cm. longum, 2 cm. latum, basi callo transverso instructum. *Columna* crassa, clavata, incurva, circa 1·3 cm longa. *C. maculatum*, Gard. Chron., 1909, xlv. pp. 26, 27, fig. 19 non Lindl.

COLOMBIA. Simacota, near the River Opon, *J. Birchenall.*

A striking species from the collection of the Rev. J. C. B. Fletcher, Mundham Vicarage, Chichester. It was obtained from Messrs. Hugh Low & Co., in November, 1908, and they have since informed us that it was collected by Mr. J. Birchenall, in the district mentioned, among some species of *Mormodes*. An interesting fact about it is that both sexes appeared together on opposite sides of the same pseudobulb. The females are green with an ivory white lip, and the males, which are very diverse in structure, lighter green with brown spots. A figure has been prepared for the *Botanical Magazine*.

327. **Ornithidium bicolor**, *Rolfe* ; ab *O. coccineo*, Salisb., floribus aureis, labello macula sanguinea ornato distinctum.

Pseudobulbi caespitosi, ovoidei, subcompressi, 5–7·5 cm. longi, 3–5 cm. lati, basi diphylli, apice monophylli. *Folia* ligulata, arcuata, 15–30 cm. longa. *Caulis* floriferus elongatus, subcompressus, foliaceus ; folia patentia, oblonga, subobtusa, 7–10 cm. longa, circa 2·5 cm. lata, basi imbricata. *Flores* axillares, subfasciculati, pedicellati. *Bracteae* parvae, triangulari-lanceolatae, acutae, foliorum vaginis occultae, 5–10 mm. longae. *Pedicelli* circa 2·5 cm. longi. *Sepala* ovata, acuta, 8 cm. longa. *Petala* ovata, acuta, 6 mm. longa. *Labellum* trilobum, 6 mm. longum, basi erectum, non articulatum ; lobi laterales oblongi, obtusi, erecti ; lobus intermedius ovatus, apiculatus, recurvus. *Columna* oblonga, lata, 4 mm. longa.—*Ormithidium* sp., Rolfe in Orch. Rev. ix. p. 195.

COLOMBIA.

Introduced by Messrs. Linden, L'Horticulture Coloniale, Brussels, who flowered it in June, 1901, and presented it to the Kew collection. It is remarkable for producing two kinds of growth, the first with an ordinary pseudobulb, and the second a leafy flowering branch, which produces a succession of flowers from the leaf axils, as in *O. coccineum*, Salisb. The flowers are bright yellow, with a large crimson blotch on the front lobe of the lip.

328. **Stauropsis Quaifei**, *Rolfe ;* a *S. nagarensi*, Rolfe (*Sarcantho nagarensi*, Reichb. f.) floribus paullo majoribus et labelli lobo intermedio duplo longiore differt.

Caulis crassus, scandens ; internodi 3 cm. longi. *Folia* disticha, coriacea, oblonga, obtusa vel brevissime biloba, 20–22 cm. longa,

4–5 cm. lata. *Paniculae* axillares, circa 22 cm. longae, ramosae, densiflorae, basi vaginis ochreatis tectae. *Bracteae* reflexae, elliptico-oblongae, obtusae, 6–8 cm. longae. *Pedicelli* circa 1 cm. longi. *Sepala* patentia, obovato-oblonga, subobtusa, subconcava, 8 cm. longa. *Petala* patentia, obovata, obtusa, subconcava, 8 cm. longa. *Labellum* basi columnae affixum, continuum, trilobum, concavum, circa 7 cm. longum; lobi laterales erecti, late triangulares, subacuti, 4 mm. longi; lobus intermedius inflexus, linear-oblongus, apice lateraliter complanatus et subobtusus, 6 mm. longus; discus carina elata et subtruncata instructus. *Columna* brevissima.

New Hebrides. Santo Peak, Espiritu Santo, at 1,370 m. alt., *W. T. Quaife*, 2.

Sarcanthus nagarensis, Reichb. f., was described from a very imperfect specimen, but the structure of the flower is that of *Stauropsis*, to which it must be referred. It is a native of Fiji, and has smaller flowers and a more fleshy texture than *S. Quaifei*.

329. **Phalaenopsis Wilsoni**, *Rolfe*; a speciebus omnibus adhuc notis radicibus aëreis longis fasciculatis, caule paucifoliato et brevifoliato facile distinguenda.

Herba epiphytica, habitu *Dendrophylaci* accedens. *Radices* copiosae, complanatae, verrucosae, 30–40 cm. longae. *Caulis* brevissimus. *Folia* non vidi. *Scapi* graciles, interdum parce ramosi, 15–20 cm. longi. *Bracteae* patentes, ovato-oblongae, conduplicatae, subacutae, 5–6 mm. longae. *Pedicelli* subgraciles, 2–3 cm. longi. *Sepalum* posticum ellipticum, obtusum, circa 1·8 cm. longum; sepala lateralia elliptico-oblonga, obtusa, 1·5 cm. longa. *Petala* elliptica, obtusa, 1·5 cm. longa. *Labellum* trilobum, unguiculatum, circa 1·5 cm. longum; lobi laterales erecti, oblongi, truncati, tridenticulati, 5 mm. longi; lobus intermedius obovato-oblongus, conduplicatus, truncatus, carinatus, laevis, circa 1 cm. longus. *Columna* clavata, 6–7 mm. longa; pollinarii stipites lati, complanati.

Western China. Cliffs at 1,200 m. alt. *Wilson*, 4576.

Mr. Wilson describes the sepals and petals as pink, suffused with purple, and the lip purplish crimson. The leaves, which are absent from the Kew specimen, he describes as few and small. It has no very near ally.

330. **Sobralia valida**, *Rolfe*; a *S. Lindleyana*, Reichb. f., foliis multo majoribus, labello tricarinato et non maculato differt.

Caules robusti, glabri, 20–25 cm. alti, 3–4-phylli, basi vaginis tubulosis 2 obtecti. *Folia* late elliptica, subacuta, subplicata, glabra, subcoriacea, 12–20 cm. longa, 6–8·5 cm. lata, amplexicaulia; vaginae tubulosae, subcompressae, ancipites, 3–5 cm. longae. *Spatha* abbreviata, subfoliacea, apice subacuta et patens. *Bracteae* parvae. *Flores* pauci, heterochronici, ochroleuci, fragrantes. *Pedicelli* breves, subinclusi. *Sepala* subconniventia, lanceolato-oblonga, acuta, concava, ecarinata, 4·5–5 cm. longa. *Petala* lanceolato-oblonga, acuta, sepalis aequalia, vix concava. *Labellum* integrum, oblongum, obtusum, minute crenulatum, concavum, circa 4 cm. longum; discus tricarinatus, venis fronte pilosis. *Columna* clavata, 2 cm. longa; dentes linear-oblongi, incurvi, 4 mm. longi.

Panama, near the Darien Gold Mines.

Received from Messrs. Sander & Sons, St. Albans, and flowered at Kew in June, 1907. It belongs to a small group having an arrested inflorescence, glabrous leaf-sheaths, and a lip with crested veins, of which only five species were previously known. The flowers are whitish yellow, with a deeper yellow band on the lip, becoming deep orange in front. It was obtained by Dr. Hodgkinson, The Grange, Wilmslow, with a few other orchids, from the locality above named.

XII.—THE SECTION MICROCOS OF GREWIA IN AFRICA.

T. A. Sprague.

The genus *Grewia*, which includes at least 150* species, is confined entirely to the old world. It is very richly developed in both the African and Indo-Malayan regions, but is represented by comparatively few species in Australia and Polynesia.

Since the publication in 1868 of the first volume of the *Flora of Tropical Africa* the number of species known from Tropical Africa has been more than doubled, and it had become increasingly difficult, in the absence of any revision, to determine the new African material correctly without undue expenditure of time. On this account, a rearrangement of the Tropical African material was undertaken by the writer in conjunction with Mr. J. R. Drummond, who assumed responsibility for rather more than half of the species. A revision of the African species belonging to the section *Omphacarpus* has already appeared (*K.B.* 1909, p. 18).

Microcos was founded on "Microcos foliis alternis oblongis" Burm. Thes Zeyl. p. 159, t. 74 (1737), and was at first treated by Linnaeus as a distinct genus, but was afterwards reduced by him to *Grewia* in the twelfth edition of the Systema, 1767, p. 602.

In 1834, Wight and Arnott made it a section of *Grewia*, relying on the 3-celled ovary and terminal inflorescence to distinguish it from *Eu-Grewia* (Prodr. vol. i. p. 81). The more recent history of the section runs parallel with that of *Omphacarpus*, the principal contributions to our knowledge being those by Masters in the Floras of Tropical Africa and British India. In the former he described a new Angolan species, *G. floribunda*, which was then the only known African representative of the section, and possessed a fibrous mesocarp. In the latter he distinguished three sections as follows:—1, *Eu-Grewia*, inflorescence usually axillary, fruit fleshy or crustaceous usually lobed; 2, *Omphacarpus*, inflorescence terminal, flowers involucrate, fruit with a corky or fibrous rind [not lobed]; 3, *Microcos*, inflorescence terminal, flowers involucrate, fruit entire, fleshy.

Thus the only character given by Masters to distinguish *Omphacarpus* from *Microcos* was the corky or fibrous, not fleshy, mesocarp. But he himself had previously correctly described *G. floribunda* as

* 60, according to the Genera Plantarum (1862); 90 or less, according to Pflanzenfamilien (1890).

having a fibrous mesocarp; and this is also characteristic of the Asiatic species, *G. Microcos** and *G. paniculata*†, both of which belong to section *Microcos*. Hence it would appear that there is little beside the habit and the larger fruit to distinguish *Omphacarpus* from *Microcos*. It seems desirable, however, pending a revision of the entire genus, to follow King‡ in keeping the two sections separate. The African species of *Microcos* may be distinguished as follows:—

Bracteae 5–6 mm. longae; ovarii loculi 4–6-ovulati.
Folia exsiccando viridula, utrinque glabra nervis subtus puberulis exceptis ... ... 1. *floribunda*.
Folia exsiccando brunnea, supra stellatim puberula, subtus subtiliter pubescentia ... ... 2. *salamensis*.
Bracteae 2–3·5 mm. longae; ovarii loculi 2-ovulati 3. *Sereti*.

1. **Grewia floribunda**, Mast. in Fl. Trop. Afr. vol. i. 1868, p. 252; Hiern, Cat. Afr. Pl. Welw. vol. i. 1896, p. 97.

Angola. Mountains of Zengas de Queta and Capopa, Golungo Alto, *Welwitsch*, 1385! Near Luxillo, Pungo Andongo, *Welwitsch*, 1386! Bembe, Congo, *Monteiro!* Congo Free State. Banana, *Monteiro!* below Stanley Pool, *H. H. Johnston!*

Var. **latifolia**, De Wild. in Ann. Mus. Congo, sér 5, vol. i. 1904, p. 164; vol. ii. pp. 46, 298.

Congo Free State. Boma, *L. Pynaert*, 17; Moanda, *J. Gillet*, 3199, 4041.

G. floribunda is evidently very closely allied to the Asiatic species *G. Microcos*, L., which is known from China, India and the Malay Archipelago. Hiern's remark that it is "apparently the same species as *G. africana*, Mast." is puzzling, as there appears to be no very great resemblance between it and either of the specimens referred by Masters to *africana*.

The leaves of the type specimens (Welwitsch's) are conspicuously serrate, those of Monteiro's specimens finely serrate, and those of Johnston's very finely serrulate or denticulate. In the Welwitsch and Monteiro specimens I found, as in *G. Microcos* (see Pierre, Fl. Forest. Cochinch. t. 152) a 3–4-celled ovary with 4 ovules in each cell, whilst in Johnston's specimen the flowers examined had a 3-celled ovary with 4–6 ovules in each cell.

Var. *latifolia* seems, from the description, to differ but little from the type, the supposed difference in size of the leaves being non-existent, for Welwitsch's No. 1385 and Monteiro's Banana specimen have leaves which exceed the dimensions given for var. *latifolia*. The leaves of the type, however, are practically glabrous on the upper surface, while those of the variety are said to have scattered stellate hairs.

2. **G. salamensis**, *Sprague*, sp. nov.

Ramuli brunneoli, pubescentes, demum cinerei, glabrati. *Folia* obovato-oblonga vel obovata, basi inaequaliter rotundata, apice breviter obtusiuscule acuminata, 5·5–12 cm. longa, 3–4·7 cm. lata, supra brunnea, stellato-puberula, subtus sordide fulva, subtiliter stellato-pubescentia; nervi laterales utrinque 3–4 praeter basales;

* Cooke, Fl. Bombay, vol. i. p. 145.
† King, Materials, vol. i. p. 220.

petioli 7–10 mm. longi, fulvo-tomentelli ; stipulae caducae. *Paniculae* vix adultae circiter 7 cm. longae ; rhachis fulvo-furfuraceo-tomentella ramis patulis. *Pedicelli* circiter 2·5 mm. longi. *Bracteae* circiter 6 mm. longae, trifidae, utrinque pubescentes. *Sepala* spathulato-cucullata, 8–9 mm. longa, utrinque stellato-pubescentia. *Petala* 3·2–3·5 mm. longa, parte inferiore late obovata circiter 1·3 mm. longa et fere aequilata glandulam ellipticam 0·8 mm. latam intus gerente extus tomentella, parte superiore circiter 2 mm. longa oblonga, breviter bifida, puberula. *Gonophorum* glabrum, 1 mm. longum, medio leviter constrictum, angulatum, apice dense pubescens, 5-cuspidatum cuspidibus deltoideis patentibus 0·3 mm. longis. *Stamina* circiter 40, 4–6 mm. longa, inferne 0·5–1·75 mm. stellato-pubescentia. *Ovarium* ovoideum, tomentellum, 1·5 mm. longum, 3-loculare loculis 4–6-ovulatis ; stylus 4·5 mm. longus, inferne puberulus. *Fructus* ignotus.

German East Africa. Dar-es-Salam, *Kirk !*

3. **G. Sereti**, De Wild. in Ann. Mus. Congo, sér. 5, vol. ii. 1908, p. 299.

Congo Free State. Monbuttu land, near Gumbari, *F. Seret*, 814!

Var **rotundata**, *Sprague*, var. nov. ; foliis basi rotundatis nec manifeste cordatis, nervis basilaribus utrinque solitariis a typo recedit.

Congo Free State. Monbuttu land, *Schweinfurth*, 3599! Uganda. Bugoma Forest, Unyoro, *Bagshawe*, 1388 !

Kew is indebted to Dr. E. De Wildeman for a small portion of the type specimen of *G. Sereti*. The ovary in both type and variety is 3-celled with 2 ovules in each cell.

XIII.—MISCELLANEOUS NOTES.

Mr. Alexander Hardie, a member of the gardening staff of the Royal Botanic Gardens, has been appointed by the Secretary of State for India in Council, on the recommendation of Kew, a probationer gardener for service in India.

Sir George King.—By the death at San Remo, on 12th February, 1909, of Sir George King, K.C.I.E., F.R.S. LL.D., Kew has been deprived of an old and tried friend. He was born in Aberdeenshire on 12th April, 1840, and was educated at the Grammar School of that city. He subsequently entered the University, where he studied medicine and graduated as M.B. in 1865 with highest academical honours.

As an undergraduate his abilities and scientific tastes had commended him highly to Professor G. Dickie, F.R.S., the well-known algologist, who then occupied the botanical chair at Aberdeen. King acted for a time as assistant to Professor Dickie and, as was natural in a favourite student of such a teacher, developed a strong inclination towards the study of botanical problems

connected with cytogamic plants. Acting on the advice of Sir William Hooker, then Director of Kew, which was strongly supported by Dr. Dickie, it was King's intention to follow the example of Dr. (now Sir) Joseph Hooker and enter the Naval Medical Service. Before the close of his academical career, however, the Government of India, who since 1860 had ceased to grant commissions in the Indian Medical Service, once more opened the ranks of that service to young medical men. Influenced by the advice of Professor Harvey, the talented occupant of the chair of Materia Medica, who shared Dickie's estimate of his abilities, King decided to forego his earlier intention and entered the Indian Medical Service on 2nd October, 1865. At the close of the preliminary course of study at Netley, prescribed for young military medical officers, King was posted to the Bengal Presidency. It is of interest to note that he was entrusted by the Director of Kew with the care of the first Ipecacuanha plant to reach India; this he delivered in safety to the Superintendent of the Royal Botanic Garden, at Calcutta, on reaching that port in March, 1866.

His Indian service commenced at the General Hospital, Calcutta, but he was shortly afterwards transferred, as house Surgeon, to the Medical College Hospital and after some time was posted to military medical service in Central India and Rajputana, where at Goona, Ajmir and Mount Abu, he devoted his leisure to excellent work as a field-naturalist. From this military duty he was deputed, in December, 1868, to act temporarily as superintendent of the Botanic Garden at Saharanpur in the North-west (now the United) Provinces; after this duty was over he was induced to enter the Indian Forest Service under the same Government, when he was put in charge of a forest circle, the headquarters of which were at Dehra Dun.

While thus employed he was, in 1871, selected by the Secretary of State for India as successor to Dr. Thomas Anderson, whose untimely death in October, 1870, had rendered vacant the Superintendentship of the Royal Botanic Gardens, Calcutta, and of Cinchona Cultivation in Bengal as well as the Professorship of Botany at the Medical College, Calcutta.

The task King had to face was a heavy one. Two cyclones of extraordinary severity in 1864 and again in 1867 had reduced every public and private garden in and around Calcutta to a miserably dilapidated state. The Botanic Gardens both as a scientific centre and as a place of public resort had practically to be renovated, and the work involved afforded ample scope for King's powers of organisation. The Cinchona plantations in British Sikkim, established by Dr. Anderson, whose life was practically sacrificed to the zeal with which he performed this duty, had reached the critical stage at which it was necessary to determine whether the extraction of the alkaloids of Cinchona bark on a commercial scale was an economic possibility. Funds were required to the perfecting of King's designs in both directions. That these were readily available gives ample proof both of the enlightened liberality of the Government of Bengal and of the confidence which King's administrative gifts inspired in the officials under whom he served. In the course of his operations

the aspect of the garden was entirely changed. Originally a portion of the rice swamp which constitutes the greater part of the Gangetic delta, King excavated a series of lakes and ponds, the soil taken from which enabled him to raise the general surface level of much of the area, so that many species which previously could not be made to thrive were now capable of being successfully cultivated. He added to the establishment green-houses, a splendid palm-house and an excellent herbarium building. The charm and beauty of the lakes and groves, the avenues and lawns for which the garden is now so justly famed, all bear the impress of King's influence and care, and serve as an adequate monument to his energy, patience and skill as a landscape gardener.

In the management of the Cinchona department King's administrative gifts were equally conspicuous. In Northern India it has been found that natural causes render the cultivation of Cinchona unprofitable to private enterprise. But in spite of this fact King so managed the plantations and factory under his control that the Government has been enabled, without incurring pecuniary loss, to place the remedies against malaria which Cinchona bark yields within the reach of the poorest peasant in India.

The extent and gravity of his purely official duties and the care and attention which the reorganisation of the Botanic Gardens and administration of the Cinchona department demanded, did not interfere with the energetic prosecution of purely scientific work, though for many years they left him no leisure for the publication of the results of his studies. But in the midst of his other work he carried out in conformity with a definite plan, the details of which were always wisely subordinated to current exigencies, a survey of the vegetation of the Eastern Himalaya, of the British provinces of Indo-China and of the Malayan Peninsula—thereby taking a considerable share in the task of providing Sir Joseph Hooker with material to aid him in the preparation of the Flora of British India and rendering the Calcutta herbarium commensurate with the needs of so important an establishment, by replacing the rich collection brought together by Roxburgh and Wallich between 1793 and 1828, which had, on the advice of the latter botanist, been taken to Europe and dispersed without leaving a set of the plants in the institution at whose cost and on whose behalf it had been brought together.

It was not until 1887, when the progress which had been made in connection with the Botanic Gardens at Calcutta, and with the factory attached to the Cinchona Plantations in Sikkim, justified King in devoting himself to the task, that he commenced the publication of important contributions to botanical literature. In this year he was enabled, through the liberality of the Government of Bengal, to found the Annals of the Royal Botanic Garden, Calcutta, and he at once proceeded to publish amply illustrated monographs of the difficult and important genera *Ficus*, *Quercus*, *Castanopsis*, *Artocarpus*, *Myristica* and of the families *Magnoliaceae*, *Anonaceae* and *Orchidaceae*. With the exception of that last mentioned, which is of interest largely from the horticultural point of view, these monographs deal with genera mainly composed of trees, many of them being of great economic importance. His

work in connection with the formation of a first-rate herbarium collection, and his experience as a forest officer, led him to realise how frequently competent field workers, whose results in obtaining material for the study of herbaceous plants or shrubs leave nothing to be desired, are deterred by what are no doubt serious difficulties from supplying specimens adequately illustrating arboreous types, and yet how extremely important from the industrial standpoint full and accurate accounts of the constituents of the Indian forests are. By precept and example he strove to remedy this well-known defect, and the accuracy and completeness of these monographs testify to the success which he was able to achieve.

Simultaneously with the preparation of these monographs, King undertook a floristic study of the vegetation of the Malay Peninsula, the results of which were published in contributions to the Journal of the Asiatic Society of Bengal, meant to serve as materials for a flora of the Peninsula, but prepared so carefully that they serve as satisfactory substitutes for a final work.

In 1891 when the botanical officers in the different provinces of India were associated in one department, King was appointed the first Director of the Botanical Survey of India, and in 1895 he was permitted to resign the botanical chair in the Medical College of Bengal in order that he might have more time to devote to his work in connection with the Indian flora.

Of the Malayan materials the first ten parts, amounting to about 1,200 octavo pages, and bringing the task to the middle of the Calyciflorae were issued before King retired from the service of the Indian Government, after thirty-three years' service, in 1898. After his retirement he was compelled, under medical advice, to spend the winter months at San Remo, but his summers were devoted to work at Kew on the continuation of the Malayan Flora. His health was, however, never satisfactory after his return to Europe, and he realised that he might not be able to finish the task he had allotted himself. By an arrangement with his friend Mr. H. N. Ridley, F.R.S., Director of the Botanic Gardens, Singapore, that botanist undertook the elaboration of the Monocotyledons of the Malayan Peninsula, while King continued to work out the remaining Dicotyledons, and after the publication of the thirteenth part, which concludes the Calyciflorae, in 1902, he was was joined by Mr. J. S. Gamble, C.I.E., F.R.S., in the elaboration of the Corolliflorae. For other three years King took his share in the joint work; since then, partial loss of eyesight and steadily increasing infirmity having led to the enforced abandonment of active participation by King in the work he had so much at heart, the task has been undertaken by Mr. Gamble alone, and the appearance of the twenty-first part, which concludes the Corolliflorae, has coincided almost to a day with King's lamented death. A list of King's contributions to botanical literature will appear in an early number of the *Kew Bulletin*.

King's services to the Indian Empire were not limited to his purely official duties. He was during the greater part of his stay in Bengal one of the most active and trusted of the Fellows of the University of Calcutta, and he served for a term on the syndicate of that institution. He was an original member of the Committee of

Management of the Zoological Garden, Calcutta, the site of which he found a collection of native huts and converted into a beautiful garden. He was a member of the Board of Visitors of the Engineering College of Bengal. in which he took a lively and effective interest. He was for many years one of the Trustees of the Indian Museum, and was at one time the Chairman of that body. He was from 1894, till he retired, the President of the Central Committee appointed by Government to investigate the indigenous drugs of the country.

His skill as a landscape gardener was recognised by the Royal Horticultural Society, who awarded him its Victoria Medal in 1901. His humane services in connection with the manufacture and distribution of the alkaloids of Cinchona bark brought him the honorary membership of the Pharmaceutical Society, the grade of Officer d'Instruction publique, the gift of a ring of honour by the Czar of Russia, and the companionship of the Order of the Indian Empire. His botanical work led to his honorary association with many learned societies and to the award of medals by the University of Upsala and by the Linnean Society. When he retired from India in 1898, a number of his personal friends arranged for the preparation of a medallion portrait which was placed in the Zoological Gardens which he had designed, while a replica was presented to the Botanical Gardens whose beauties he had restored.

His wide and accurate knowledge and the great charm of his manner rendered intercourse with him a highly valued privilege. A wise counsellor and an unfailing friend, his loss is deeply mourned and his memory is treasured by the members of the Kew staff, with whom he was so long and so intimately associated.

The Earl Annesley—We have to record with regret the death of Hugh Annesley, 5th Earl Annesley, which occurred at Castlewellan, Co. Down, on December 15th, 1908. He succeeded his brother in 1874, and was descended from the fourth son of the first Viscount Valentia. In this connection it may be recalled that the famous Arley Castle arboretum, now the property of Robert Woodward, Esq., was planted by the second and last Earl of Mountnorris, the son of the eighth Viscount Valentia who was created Earl of Mountnorris, the title becoming extinct in 1844. Lord Annesley was animated by a sheer love of plants and trees for their own sake with little or no interest in their botanical aspect. At Castlewellan he created, between 1874 and 1908, one of the most extensive collections of ligneous plants in Europe. The domain is a delightful mixture of mountain, water and wood, situated on the sheltered slopes of the Mourne mountains a few miles from the sea and enjoying the climate of the west of Scotland. Here *Myosotidium* produces leaves a foot across and *Lomatia ferruginea* figured in the *Botanical Magazine*, from Castlewellan and seldom seen in cultivation affords a good illustration of its possibilities. A brief notice of Castlewellan appeared in the *Bulletin*, 1906, p. 221, but its charms are well known to lovers of trees through Lord Annesley's interesting book entitled "Beautiful and rare Trees and Shrubs"

published in 1903 and illustrated by numerous photographs from his own hand. He also published numerous notes on his plants from time to time in the Gardeners' Chronicle. In addition to his trees and shrubs he had also a considerable collection of interesting plants under glass.

Shy and reserved, Lord Amesley was never so happy as when he was among his plants. He took little pleasure in London life and was always impatient to get back to Castlewellan. He liked to visit Kew and received a considerable amount of help from it with regard to botanical questions in connection with his book.

He will long be remembered as an excellent landlord of an extensive property and as the creator of a magnificent collection of ligneous plants.

Alteration of walks.—The fence which for fifty years had separated the "Botanical Garden" from the "Pleasure Grounds" or Arboretum was removed in 1895. A path on each side of it had been necessary so long as the two sections of Kew remained distinct, but when the fence was taken down these two walks, where they ran parallel and within a few yards of each other, lost their meaning, except that one was used as a service road for carts, &c. From the landscape point of view, also, this duplication of walks was wrong. During the past winter that section of the service road reaching from near the Victoria gate to the point where it joined the road leading to the Stable Yard has been broken up and will disappear. The path for visitors which went behind the Temple of Bellona and ended at the Unicorn Gate has been brought in front of the Temple, and now ends close to the Victoria Gate. It may be of interest to mention that this path is a portion of the ancient "Stafford Walk," made, so tradition says, by the Staffordshire Militia about 1770. It commenced at the north end of the Rhododendron Dell, passed through the "Hollow-Walk Wood" across the Sion Vista, and ended, as already stated, where the Unicorn Gate now stands.

Berberis Dell.—Kew, in general, is so flat that such diversities of level as it possesses (and they are all of artificial origin) acquire a peculiar value in the landscape. Next to the Lake and the Rhododendron Dell, the most important excavation in the Gardens is the Berberis Dell. Originally it was a pit from which gravel was taken to cover the paths. The idea of developing it into a garden for shrubs was entertained as early as 1869. The depression was considerably enlarged during the next five or six years, and by 1876 it had been brought to its present conformation and planted with trees and shrubs belonging to the early Natural Orders. The species of *Berberis* being the most numerous, it came to be called, perhaps unofficially, the "Berberis Dell." It is one of the most picturesque spots in Kew, the apparent depth of the hollow being increased by its proximity to the mound on whose summit the flagstaff stands—once the site of the Temple of Victory. A new entrance to the Dell has recently been made from the Kew Road

side. The path that runs parallel with the wall is now a very popular walk but access from it to the Dell was previously rather restricted. The new entrance gives an extended view right through the valley in a north westerly direction to the Pagoda Vista and beyond.

Botanical Magazine for February.—The Eastern Himalayan *Alpinia bracteata*, Roxb., is figured from a plant raised from seed communicated by the Royal Botanic Garden, Calcutta, in 1882. It was not, however, till 26 years after, in May, 1908, that its showy but rather fugacious flowers were first produced. These resemble somewhat those of the orchidaceous genus *Phaius*. *Oligobotrya* is a genus of Liliaceae, tribe Polygonateae, which is limited at present to the species figured. This, *O. Henryi*, Baker, is a native of Central China, and has been introduced into cultivation by Messrs. James Veitch & Sons, who furnished the material for the illustration. Besides the typical form, which has white or pale yellow flowers, a new variety (*violacea*, C. H. Wright), in which the outside of the perianth-tube is violet, is figured and described. *Eranthemum Wattii*, Stapf, is an ornamental species from Northern India, which has been introduced by Col. R. H. Beddome. Under the name of *Daedalacanthus parvus*, C. B. Clarke, it has been in cultivation at Kew for about ten years. It is also known as *D. Wattii*, Beddome. Allied to *Eranthemum nervosum*, Roem. & Schultes, it is distinguished by a dwarfer stature, shorter spikes and purple flowers. *Pinus Bungeana*, Zucc., is a distinct species of the 3-leaved section, and is peculiar in that the bark in old trees falls off in white flakes, giving the trunk something of the appearance characteristic of that of the Plane. The cones are small with relatively few scales, which are much thickened at the apex and are shortly reflexed mucronate. The species is a native of Northern China and has long been in cultivation at Kew. *Sorbus (Aucuparia) Vilmorini*, Schneider is an attractive shrub or small tree, with elegant pinnate leaves, terminal corymbs of pretty white flowers, and red globose fruits about $\frac{1}{3}$ in. across. The Kew plant from which the drawing was prepared was presented by Mr. M. L. de Vilmorin, in 1905. It is a native of South-western China.

Mummy-Coffin Wood.—A query has been addressed to Kew as to the wood used for Mummy-Coffins in Eygpt, which was stated by the correspondent to be that of Sycamore. Some pieces of Mummy-Coffin wood were presented to Kew in 1875 by Mr. H. H. Calvert, H.M. Consul at Alexandria, and later, specimens of the wood of *Ficus Sycomorus* were forwarded from Egypt by Dr. Schweinfurth. The microscopic structure of these specimens has been compared in the Laboratory and there is no reason to doubt that the Mummy-Coffins of which we possess specimens were made from the wood of *Ficus Sycomorus*. The following note has been prepared on this subject.

The structure of the two examples of mummy coffin wood, referred to above, is remarkably well preserved. This may perhaps be attributed partly to the natural durability of the wood, but chiefly it is due to the conditions to which it had been subjected. These were no doubt eminently favourable for preservation, since, as Schweinfurth points out*, the air in the Egyptian tombs must have usually remained constantly dry, on account of the climate and the nature of the tombs, the latter being deep rock-built halls, to which practically no external air would penetrate. In the case of the more delicate parts of plants, such as leaves and flowers, the degree of preservation is more surprising, thus, when specimens of this kind are found enclosed in undisturbed coffins, their condition is described as being often equal to that of specimens from old but well-kept herbaria.

The wood of the Sycomore-fig (*Ficus Sycomorus*, L.) is stated to have been very generally used for making mummy-coffins or sarcophagi†. These were either made of boards joined together, or consisted of two pieces—coffin and lid, and, in the case of mummy-shaped coffins, were sometimes multiple structures, two, three, or more coffins fitting one inside the other.

The same wood was largely employed for the carvings of the temples, images of gods, and statues of priests, and also for the manufacture of the most various kinds of furniture, implements and utensils. Another wood used for similar purposes was that of the *Acacia* (*A. Nilotica*, Del.). It is claimed by Woenig that these two trees, in association with the date-palm, were the only two, which grew in groups, and perhaps even formed forests, and that consequently the Egyptians were obliged to depend almost exclusively on them for their supply of wood. The wood of the Sycomore-fig is described as very knotty and hard to work, but at the same time very durable.

The Sycomore-fig appears to have been highly valued by the Egyptians on account of the cool shade given by its dense foliage, as well as for its more practical uses, the stem and branches supplying timber, the twigs being used for burning, and the fruits as food. Medicinal properties were ascribed to different parts of the plant by Pliny‡, who states that the juice of the cortex is an antidote for snake-poison, besides having other curative properties. It is probable that the medicinal use of this plant may have had an early origin in Egypt.

The fruits of this plant have been found among the offerings in tombs, and figure largely in the coloured sculptures, representing offerings, on the walls of the temples. A picture belonging to the fifth dynasty (*i.e.* between 2840 and 2744 B.C. according to Lepsius) represents two men picking the fruits of this species. In

---

* G. Schweinfurth, Ueber Pflanzenreste aus altaegyptischen Gräbern, Ber. d. deutsch. bot. Ges., 1884, p. 351.

† F. Woenig, Die Pflanzen im alten Aegypten, Leipzig, 1886. This book, which collects the results of numerous authors (both Egyptologists and Botanists) is the chief source of the following information.

‡ Pliny, Hist. Nat., Harduinus, ed. 2, xxiii., 70 :—"Mora in Aegypto et Cypro sui generis, ut diximus." The footnote to this shows, by comparison with lib. xiii, sect. 14, that *Ficus Sycomorus* is the Egyptian plant referred to.

this and in many other cases the accuracy of the drawing is stated to be quite sufficient for the identification of the tree or fruit. The tree was sacred to Isis, Nephthys and Hathor, and appears to be identified with the "tree of life," beneath which the soul of the departed received the "wreath of justification." A picture of the tree in the Book of the Dead shows two hands projecting from the foliage, and offering food and drink to the wandering soul. Isis and Nephthys were regarded as protectors of the dead, and it was perhaps for that reason that twigs of the Sycomore-fig were sometimes added to the offerings in the tombs.

The tree, which attains a great age, grows wild in Northern Africa (in Egypt, Nubia, Abyssinia, and in oases), where it is also cultivated in gardens, and planted, for the sake of the shade that it gives, by road-sides and in groups near villages.

L. A. B.

Mummy Cloth.—Three samples of mummy cloth have been sent to Kew for examination by Mr. G. D. Morce, Dorset Square, N.W. Two of the samples were of about the date B.C. 900 and the third B.C. 500. Mr. Boodle reported that all the samples appear to have been made from flax. One of the samples was of coarser fibre than the others and had probably been soaked in some greasy or waxy substance.

Pilocarpus racemosus.—The recent note in the *Bulletin* on this subject (*K.B.*, 1908, p. 310) should have contained references to two articles on *P. racemosus* by Mr. E. M. Holmes, F.L.S., Curator of the Museums of the Pharmaceutical Society (*Pharm. Journ.* ser. 4, vol. xvii., 1903, p. 713; vol. xviii., 1904, p. 54). From these it appears that the leaves of *P. racemosus* came on the London market as Guadeloupe Jaborandi in 1903, when they were examined in the laboratory of Messrs. Wright, Layman and Umney, who found only 0·34 per cent. of total alkaloids. As a previous analysis by Dr. D. Rocher, quoted by Holmes, gave 1·0 per cent. of alkaloids, of which three-fifths were pilocarpine, it seemed desirable to have a further analysis; and a sample of the leaves was accordingly submitted to Mr. A. J. Cownley, who found that they yielded 0·6 per cent. of total alkaloids, which gave about 50 per cent. of a crystalline nitrate melting at 155° C. As pure pilocarpine nitrate has a melting point of 178° C., and anhydrous isopilocarpine nitrate a melting point of 159° C., it seemed probable that the nitrate consisted largely of isopilocarpine nitrate. Isopilocarpine is estimated to have only one-eighth to one-tenth of the strength of pilocarpine, physiologically. Further experiments are therefore required to ascertain whether Guadeloupe Jaborandi leaves can be used as a source of pilocarpine nitrate. Holmes suggests, in conclusion, that the discrepancy in the percentages of alkaloids may have been due to the leaves having been collected at different periods of the year.

T. A. S.

West Indian Reports.—From the Imperial Commission of Agriculture for the West Indies the following reports have been recently received:—(1.) Report on the Agricultural and Botanical Department Barbados for the period 1898–1907, with a review of the sugar cane experiments since 1884. (2.) Reports on the Botanic Stations, &c. St. Lucia, 1907-8. (3.) St. Kitts, Nevis, 1907–8. (4.) Antigua, 1907–8. Of these the first mentioned is of particular interest, since it gives a review of the Sugar and Cotton Industries in Barbados since the foundation of the Imperial Department of Agriculture in 1898. The report is illustrated by some good photographs. The history of the Introduction of the Sea Island cotton in 1903 is given and the progress of the industry summarised. In 1902–3 the value of the cotton from the 16 acres grown in Barbados was £318, whilst in 1906–7 the acreage under cotton had risen to 5,000, yielding lint and seed of the total value of £76,376.

An account of the Banana industry, which is also illustrated by excellent photographs is of interest and affords an example of the difficulties which are encountered in endeavouring to establish an industry with an export trade.

In Antigua, in 1907–8, 2,508 acres were under cotton, shewing an increase of 683 acres over the previous year; considerable loss, however, is reported owing to insect pests.

Experiments with Sugar-canes.—Report of the Agricultural work for the season between 1905–7 carried on under the direction of the Imperial Department of Agriculture for the West Indies, Barbados, 1908. Parts i. and ii., Manurial Experiments with Sugar-cane. Part iii., Experiments with varieties of Sugar-cane. By J. P. d'Albuquerque and John R. Bovell.

The work summarized in Part i. of the report deals with the composition of Barbados' rainfall. The weather conditions during the season under review were not altogether favourable to the growth of canes, the rainfall at first being below the average and drought setting in again at a later period. The total amount of rainfall was 76·53 inches, and this supplied approximately 175 pounds of chlorine and 9·5 pounds of nitrogen per acre.

The manurial experiments are dealt with in Part ii. These were conducted at Dodd's Botanic Station and at five other estates on different parts of the island. Both red and black soil areas were represented. The results, set forth in a number of tables, show a substantial increase in crop by the use of either farmyard or artificial manure. With regard to the former, better results were obtained from the application of this substance plus artificial manure than from the use of farmyard manure alone. The effect of phosphatic and potassic manures was variable, but the use of nitrogen after farmyard manure was found both in the case of plant canes and ratoons to yield highly satisfactory results.

Part iii. deals with the important subject of raising new and improved varieties. A very large amount of work has been carried out in this direction, and the results obtained during the season 1905–7 are given in detail in the report.

The characters that determine the value of any variety of cane are arranged in two categories as follows :—

Field Characters :—

1. Germinative power.
2. Behaviour under extremes of dryness and moisture.
3. Habit, upright or recumbent.
4. Power of resisting the attacks of insects and fungi.
5. Period of growth.
6. Productive power in tons of canes.
7. Tonnage of tops.
8. Ratooning power.

Factory Characters :—

1. Milling quality *i.e.* whether the canes are tough or brittle.
2. Fuel-producing property, depending on the percentage of fibre.
3. The relative percentage of expressible juice, determining the "dryness" or "juiciness" of the canes.
4. The richness of the juice.
5. The purity of the juice.

The seedling canes are first subjected to a preliminary field selection, and then to an agricultural and chemical selection which elimates all varieties except those possessing superior qualities. The individuals selected are then used for experimental purposes. During the period under notice, 4,874 seedlings were raised and planted out, making a total of over 32,000 seedlings during the past ten years. Throughout the work the cane that has been used as a standard with which to compare the seedlings was that known as "White Transparent"

The results of the experiments may be regarded as exceedingly satisfactory, a large number of the new canes showing a great improvement in saccharose yield over that of the standard variety. This applies to canes suitable both for red or black soil estates. Full details are given in the tables at the end of the report, whilst other less elaborate tables furnish a summary of the more important results. The success and importance of the experiments will be gathered from the following extract from the covering letter of the Commissioner of Agriculture for the West Indies :—"Table XLVI., giving the mean results of varieties of canes grown on black soils and the average for three and four years arranged according to saccharose yield, shows that White Transparent came out ninetieth with 6,670 lb. of saccharose, whilst the seven best varieties gave over 9,000 lb. of saccharose per acre, and it is now generally recognised that these experiments are proving of great value to the sugar industry of this island. Every year they are receiving more recognition from the planting community, and it is on record that on one estate in British Guiana, more profit has been derived from the cultivation of Barbadoes and British Guiana seedling canes that would cover the cost of the sugar-cane experiments at Barbados, since they were inaugurated in 1884."

Experiments with regard to artificial hybridization are also in progress in Barbados, but up to the present time the varieties thus raised show no indication of giving better results than some of the ordinary seedlings.

A. D. C.

Phalaris commutata.—In the *Agricultural Journal of the Cape of Good Hope*, January, 1909, pp. 26, 27, an account is given of "another new fodder grass — Phalaris commutata," with an illustration of a growing plot of the grass.

This grass has been introduced to the Cape and into Natal from Australia as a drought resisting grass. The plants were raised from seeds sent from Australia which were sown in January, 1908. When about 18 inches high, at the end of April, they were transplanted and the plants were placed 2 feet apart in rows three feet from each other.

In August one of the plants was taken up and placed in one of the driest spots on the farm; but although the spring was a very dry one and the surrounding bush was brown, this plant at the beginning of December was still green and in full ear, standing about 4 feet high.

From another stool which was taken up at the beginning of September and subdivded, 76 plants were obtained; these were planted 18 inches apart, each row being a foot apart. The photograph in the paper shews one of these plots with stems over eight feet high and no thicker than oat straw. Over 150 stalks were found to arise from a single stool.

It is stated that the *Phalaris* stools planted last April are much bigger than *Paspalum* plants, planted three years ago.

The ears appear to get badly broken by the wind and in the photograph the plants are shewn protected by wires to prevent flattening down.

According to the Analysis by the Government Agriculturist, "*Phalaris commutata*" shews the following composition in comparison with other grasses :—

—	Moisture.	Proteins N. × 6·25.	Fat.	Ash.	Total carbohydrates (including fibre).	Fibre	Fuel value calories per lb.		Nutrient ratio.
							Including fibre.	Excluding fibre.	
Phalaris commutata	13·77	10·37	2·94	14·60	58·32	23·96	1369	973	4·0
Italian grass ...	14·30	9·54	2·91	8·62	64·63	19·48	1427	1073	5·4
Perennial rye grass	14 30	10·29	2·70	8 85	63·91	28·68	1461	939	4·0
Phalaris canariensis	14·15	17·50	2·05	7·47	58·83	40·13	1472	742	1·3
Timothy grass ...	14·30	6·31	1·93	4·29	73·17	28·25	1525	1010	7·8
Kentucky blue grass	14·30	9·75	2·29	5·52	68·14	33·88	1510	993	4·1

An account of this grass is also given in the *Natal Agricultural Journal*, November, 1908, p. 1436, with five interesting plates.

Its drought-resisting properties appear to be very well suited to the dry parts of Natal, and its rate of growth is remarkably quick. One of the illustrations shews a block of the grass 21 days after cutting which had reached a height of 21 inches.

The grass will stand frost, and horses and cattle are said to be very fond of it.

The grass is said to be a native of Southern Italy and other Mediterranean countries.

A difficulty exists as to what this plant "*Phalaris commutata*" of the Australians may be. According to Parlatori (Fl. Ital. I. p. 70) *Phalaris commutata*, R. & S. was described from a mixture of the vegetative parts of *Phalaris nodosa* and the panicle of *P. minor*. Unfortunately there are no specimens of this grass from Australia at Kew so that it is not possible to assign it a definite name. It cannot well be *P. minor*, since this is an annual rarely attaining a height of more than two feet. *P. nodosa* however frequently grows in dry places. Until specimens have been seen, it will be best to refer to this grass as "*P. commutata* of Australia."

According to the *Journal Dep. Agric. W. Australia*, 1907, p. 652, this grass was introduced into Queensland in 1884 by Mr. Harding, Curator of the Toowomba Botanic Gardens, being one of many grasses obtained by him from the Dept. of Agriculture of the United States of America.

Commelina nudiflora.—In July last, a letter was received from British North Borneo, giving information about a creeper which was said to kill the Lalang grass in rubber plantations. Specimens of the weed were enclosed and proved to be the common tropical weed *Commelina nudiflora*, L.

Mr. H. N. Ridley, Director of the Botanic Gardens, Singapore, writes that "the plant is an almost useless little weed. It requires rather good soil, nicely turned up, and then it makes a mass of stuff. It cannot grow with Lalang and not at all on the clay ground where Lalang is most troublesome." . . .

A short note on the plant, by Mr. T. W. Main, in the *Agricultural Bulletin of the Straits* for January, 1909, p. 8, is as follows :—

"It is said to be a splendid plant for destroying Lalang and has been recommended to owners and managers of rubber plantations for this purpose. How such an inobtrusive little plant should have gained such notoriety is quite remarkable.

"The habit and growth of this little creeper makes it quite unfit for such purposes. In the first place, it grows best in damp swampy places, generally in small patches here and there or by the sides of ditches or small streams, and I have never seen it growing on drier Lalang land or in conjunction with Lalang. It is not by any means a robust growing creeper, never rising more than six or eight inches from the ground and does not even possess the property of climbing other vegetation. It is this property of climbing over other plants and smothering them which recommends a plant as an eradicator of Lalang, for example, *Passiflora foetida* is recommended by many because it possesses this habit.

To Face Page 81.

SKETCH MAP OF NGAMILAND

Ordnance Survey Office, Southampton, 1909.

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 3.] [1909.

XIV.—THE FLORA OF NGAMILAND.

INTRODUCTION BY MAJOR E. J. LUGARD, D.S.O.

The herbarium specimens, which, at great expenditure of time and skill, Mr. N. E. Brown has so carefully determined, were collected by my brother (Sir F. Lugard) and myself in 1896, and by my wife and myself in 1897–8, in that part of the Bechuanaland Protectorate which is locally known as Ngamiland.

Mr. Brown's list sufficiently indicates the character of the vegetation, but I have been asked to write a prefatory notice describing the physical and general characteristics of this region, which is seldom visited by Europeans, since it is cut off by the long "thirsts" of the waterless Kalahari Desert from the civilized parts of South Africa.

PHYSICAL FEATURES.

Ngamiland may be defined as the country around Lake Ngami, or, from a political and administrative point of view, as the country controlled by the Chief of the Batawana, a small western offshoot of the Bamangwato; the latter is by far the largest of the Bechuana tribes, and is ruled by the famous Chief Khama. Under the former definition the boundaries of Ngamiland are indefinite; but the Batawana country—radiating from the Chief's capital near Lake Ngami, and stretching into the Kalahari Desert to the south and east—was defined by Proclamation (No. 9 of 1899), after an Enquiry held by an Imperial Special Commissioner (Lt.-Col. Panzera, now Resident Commissioner of the Bechuanaland Protectorate), as being bounded on the north and west by German Territory, on the east by the meridian (about Long. 24° E.) passing through a beacon at Makalamabele on the Botletli River, and on the South by the 21st parallel of south latitude. The Batawana Native Reserve is in area some 38,000 square miles. It forms the most remote province of the Bechuanaland Protectorate administered by the Resident Commissioner whose headquarters are at Mafeking, 700 miles away

(12610—6a.) Wt. 35—183. 1375. 4/09. D & S.

across the Desert. The symbol of authority, the immediate controlling force on the spot, is the usual 'corporal's guard' in the form of some twenty Basuto police under two European officers with ten or twelve European N.C.O's. and troopers. The senior officer holds a Magistrate's commission.

Lake Ngami and the River-system.—Lake Ngami, the centre of which lies in about Lat. 20° 30′ S. and Long. 22° 50′ E., was first discovered by Livingstone and Oswell in 1849. At that time it was "a fine-looking sheet of water" some 20 miles long and 10 wide, and the roar of its waves was said to resemble thunder! But during the past half century the process of desiccation* in this part of Africa, already apparent in Livingstone's day,† has proceeded so rapidly that Lake Ngami has ceased to be a lake, and is now practically dry. It has become a vast expanse of reeds growing on a treacherous bottom, impassable to man or beast. It is true that, in years of exceptional rainfall in the countries to the north, the depression still fills up for a few months with the water brought down by the Okavango and Tamalakan Rivers. This occurred in 1899, when I last saw the Lake, but I am told the water gradually disappeared, and the Lake has not filled again. Water may at any time be found in the Lake bed at a depth of some 20 feet, but it is brackish and unpalatable.

Broadly speaking, Lake Ngami may be considered the northern limit of the Kalahari Desert, and the southern and lowest point to the S.W. of an inland river-system which finds no exit to the sea. The drainage, therefore, is towards this depression to the S.W., and towards the Makarikari Salt-pan which is at a still lower level some two hundred miles to the S.E. Lake Ngami is now in the intermediate stage between a lake and a salt-pan, of which latter there are many in the Kalahari Desert to the east. The altitude of the Lake is about 2,500 feet above sea-level. Space does not admit of more than a slight reference to the remarkable river-system of the country lying immediately north of Lake Ngami. It consists of a network of rivers and reed-grown swamps, of which the Tamalakan and the lower reaches of the Okavango are the extreme east and west channels. They are essentially the same river, linked up by innumerable channels "so many no one can tell their number," as Livingstone was told. This river-system has its rise in the countries of heavier rainfall to the north, and it empties itself either into the depression of Lake Ngami, or into the Botletli River (as the lower reaches of the Tamalakan are called) which ultimately loses itself in the sands of the Desert. No water can now enter the Lake from the north-west, as the channels have become completely silted up, but, in years of exceptional rainfall in the countries to the north, the flood brought down by the Tamalakan will fill up the channel of the Botletli to the south-east and a narrow arm of the Lake (called the "Lake River") linking up the Lake to the south-west. We may then have the phenomenon of a river dividing and flowing two ways, as mentioned by Livingstone ;‡

---

* Vide *Die Kalahari* by Dr. S. Passarge, Berlin, 1904.
† *Vide* Livingstone's *Travels in South Africa*, page 66.
‡ *Vide* Livingstone's *Travels in South Africa*, page 67

this, I am told, actually occurred in 1899. The annual rise of this river-system is, therefore, in no way dependent on the local rainfall (which is very limited), and occurs in the middle of the driest season of the year, flooding large areas of country. The Botletli River, where it has become a dry channel with occasional pools, mysteriously rises by subterraneous percolation before the flood reaches it.

The Kalahari Desert.—The Kalahari Desert which stretches away to the south and east of this river-system is a desert only by reason of an entire absence of surface water during the greater part of the year. So far as vegetation is concerned, it is in no sense a desert; although it is a dry place where no water is, it is covered with trees and bushes and a luxuriant growth of sweet grasses. The Northern Kalahari consists for the most part of level plains, at an altitude of nearly 3,000 feet above sea-level, of light sandy soil, varied at times by undulating sand-dunes. There is very little outcrop of rock; walls of limestone appear in places along the banks of the Botletli River and along what was formerly the south shore of the Lake; and occasionally low kopjes rise out of the plain, notably in the case of the Kwebe Hills, some 20 miles south of the Lake, to which fuller reference is made later. The sole supply of water in the dry season, which lasts some eight months of the year, is from Bushmen's pits, which only occur at great intervals on certain recognized routes; the trek over the intermediate country—mostly heavy sand—involves the formidable "thirsts," which are held in so much dread alike by whiteman and black. The worst "thirsts" (viz. treks between water-pits) of "the Great Thirstland" are, however, found in the Southern Kalahari Desert. The water-pits tap the catchment areas in a limestone formation, or more often in a sandstone formation with perhaps a surface stratum of limestone.* They vary in form and daily yield from a semi-open pit capable of yielding sufficient water for one or more spans of oxen maddened by the previous "thirst," to a Bushmen's sucking-pit where each drop is obtained only through a suction reed, and a white traveller is grateful for it secondhand from the mouth of a naked savage!† Needless to say this waterless country is practically uninhabited by man, while the larger mammals, such as the giraffe, eland, gemsbuck and other antelope, either travel very great distances to water, or sustain themselves during the dry season on the desert water-melons (*Citrullus vulgaris*) and succulent roots. Even the melons are very local and uncertain, and for many months of the long, dry African winter, when there is no dew in the Desert, the wild game gets no water whatever. Even the local breed of domestic sheep and goats can exist for months without water, and still retain condition.

The few humans that are found in the heart of the Desert are the so-called Bushmen. The dwarf Bushmen, the true aborigines of this country, are practically extinct or are only found far to the south. As Dr. S. Schönland said in his paper before the South

---

* *Vide* Paper read by Dr. S. Passarge at the Berlin Geographical Society, April, 1899.

† *Vide* Livingstone's *Travels in South Africa*, page 51.

African Association, 1904, the Bushmen of the Kalahari are probably distinct from the Drakensburg Bushmen; this was also the view of Mr. A. A. Anderson. In the Northern Kalahari the Bushmen undoubtedly have a large admixture of other blood, and are much taller. Various weaker tribes have in the past been pressed back on the Desert by their more powerful neighbours, and are now in a state of serfdom; these are collectively known as Bakalahari. The Bushmen near Lake Ngami, however, have little or no Bantu blood, and are of a very low type; they speak with the click, and their language is almost impossible for a European to acquire. Both sexes wear the minimum of clothing. They are entirely nomadic in their habits; they never build any kind of hut, seldom even a shelter of branches, and they never cultivate the soil. They obtain fire by the friction of one stick working in the hollow of another. They subsist on succulent roots and on game and other animals shot with their poisoned arrows; they are unsurpassed as trackers. They draw from the desert-pits their supply of water, which they will carry to great distances in ostrich egg-shells; their need of water is slight. No game shot in the Desert is ever wasted; the Bushman, like the vulture, is hovering somewhere on the horizon, and as mysteriously appears at the death. His lean starved dog is fortunate if even a remnant of offal is available for him.

Near the Lake the Batawana dwell. The origin of the tribe was as follows:—"About 100 years ago, the younger brother of the then Chief of the Bamangwato separated from them with his followers. His name was Tawana (young lion), and he went—or was driven—to Lake Ngami, where he subdued the Makoba and other tribes. He then settled down there, ruling his followers, called after his own name the Ba-tawana (people of Tawana), and the various tribes which he subdued about Lake Ngami and along the Okavango River."*

The present Chief, Mathibi, was installed by Government as the rightful heir in 1906, when Sekgoma was deposed and deported to avoid tribal war. The Chief's town, Tsau, lies some 30 miles north-west of the Lake, on one of the channels of the Okavango. The Batawana are, as I have said, an offshoot of the Bamangwato, one of the Bechuana tribes, a Bantu race of the same stock as, but far inferior to, the Zulu. Numerically the Batawana are not strong—they probably do not exceed 1,500. They are, however, mostly well-mounted and well-armed, good hunters and good shots; like all the Bechuana tribes, they are most jealous of their hunting rights. They are the ruling race of this region, and hold in subjection other tribes earlier established in the country, such as the Makoba, fisherfolk who live in small villages on the river. The Bakalahari and the Bushmen yield their tribute of skins to them as their overlords.

The principal crop cultivated is Indian corn or "mealies" and, to a lesser extent, "kaffir corn" (*Sorghum vulgare*); their agricultural methods are of the most primitive type—their only implement the typical hoe of Africa. "Sweet potatoes" and "monkey

* *Three Great African Chiefs*, page 5, by Rev. E. Lloyd.

nuts" are grown to a limited extent; tobacco is grown in some plenty. No fruit trees of any kind are cultivated, nor are there any indigenous fruits palatable to the European. The Batawana, like all the Bechuana tribes, were the owners of vast herds of long-horned cattle, until the rinderpest in 1896 caused such terrible devastation. However, I am informed there has been no recrudescence of rinderpest or other cattle disease, except a small outbreak of "lung-sickness" amongst imported cattle, which was stamped out by stringent measures, and herds of considerable size are reappearing in the land. They also have large herds of goats and fat-tailed sheep, the latter so admirably provided by nature with the means of facing the stress of "lean months." The Batawana possess a few horses, but unless 'salted' (*i.e.* recovered from 'horse-sickness') imported horses seldom survive. The tse-tse fly (*Glossina morsitans*), fatal to all domestic animals, was formerly troublesome in parts of the river area, but since the extinction of the wild buffalo in these parts by the rinderpest in 1896, it has now completely disappeared.* I myself, however, caught many tse-tse flies on the Chobi in 1899, where there were then no buffalo.

Climate.

There are two well-defined seasons, the rainy season and the dry. The latter, when rain is practically never known to fall, extends from April to the end of November. Just before the rains break the relative humidity of the air is very low, and wind and dust-storms are very prevalent; the temperature reaches its maximum, about 100° within the hut, and even the cold night—that great redeeming feature of Africa—sometimes fails. The rainy season usually commences with heavy thunderstorms. In no part of the world have I seen so great a transformation in so short a time as at the breaking of the rains in the Kalahari. Within a few days, the land, which was a study in khaki, apparently covered with lifeless sticks and dead herbage, bursts into dense foliage and flower, and "the desert blossoms as the rose." Within a day or two of the first heavy shower, thousands of lilies and other bulbous plants spring out of the sand; the grass, which had completely died down, springs up afresh, and millions of tiny seedlings of a great variety of annuals literally carpet the ground. Until the close of the rainy season at the end of March there is a constant succession of flowering plants. The rainfall is limited and irregular, in some years almost entirely failing, but its occurrence in summer and not in winter no doubt accounts for the comparative luxuriance of the vegetation. The coldest month is July, in the middle of the dry season, when I have registered on the Okavango River in Lat. 19° S. as many as nine degrees of frost at night. The country is healthy throughout the dry season, but malaria and "Blackwater Fever" of a particularly virulent type attack Europeans during the rains, especially in the depression of the Lake and the river area, where mosquitoes are a pest.

---

* *Vide* Mr. Selous' paper in the *Journal of the African Society*, Jan., 1909.

Flora and Fauna.

When asked in 1896 by the authorities at Kew to make a collection of the flora of this country, we were told that it was practically a *terra incognita* to the botanist—a fact sufficiently demonstrated by our capture of no less than 92 new species out of a total of 373, and it still affords an immense field of exploration for the botanist. The specimens which have now been determined were, with a few exceptions, collected in and around the Kwebe Hills, which are situated some 20 miles south of Lake Ngami. The collection may be considered representative of this part of the Northern Kalahari Desert, and, with the exception of the grasses, it is fairly exhaustive. The flora of the river area differs to some extent. The Kwebe Hills are an isolated group of low, bush-clad kopjes of a porphyry formation with an occasional outcrop of barren quartz. The highest hill is some 600 feet above the level of the surrounding plain, which latter is at an elevation of nearly 3,000 feet above sea-level. The range is some 12 miles long in a N.E. to S.W. direction, but not more than 6 miles at its widest point. The kopjes are very rough and boulder-strewn, but the sand of the surrounding desert has penetrated into the group in the intersecting valleys. The range, which was formerly well supplied with springs, is now devoid of water save for two water-pits; these are situated in the centre of the hills in a shale and limestone formation, and still yield a fair supply. Formerly these hills were the headquarters of the Batawana, but with the drying-up of the wells they were forced to migrate with their herds of cattle to the river area. While in the surrounding plains we found practically no plant which did not grow in or around these hills, there were many species growing in the hills which were not found elsewhere. Although situated within the Tropics, the Northern Kalahari Desert, with its limited rainfall and its elevation of some 3,000 feet may be considered the northern limit of the sub-tropical flora of South Africa. There are no palm trees, with the exception of a few Borassus palms at the T'klakani water-pits and on the Botletli Flats. The trees are all deciduous, there is practically no evergreen in the Kalahari away from the rivers. The great majority of trees are of the Acacia family, of which the largest and most handsome is the *A. Giraffae*; we discovered three new species. The baobab (*Adansonia digitata*) grows in great numbers in the Kwebe Hills, and occurs less plentifully in other parts of the country. It does not here attain a greater girth than 50 to 60 feet. The "Machihara" tree (*Terminalia prunioides*), though of no great size, is of local value on account of its hardness. In the desert further to the east, the Mopani (*Copaifera Mopane*) covers large areas in places where the soil is less sandy. The only hardwood trees of large dimensions are confined to the river banks. Only on the banks of the Okavango is found the Kigelia (*Kigelia pinnata*) with its handsome claret flowers and quaint sausage-shaped fruit, which occurs throughout tropical Africa. The African mahogany (*Khaya* sp.) does not extend so far south; there are no cypress or other coniferous trees, and no rubber-yielding trees or "vines," all of which are found in the countries of heavier rainfall immediately to the north. In fact there would appear to be no valuable timber

in the country, nor would it be possible to export any such if it existed. A species of the cotton plant (*Gossypium Stocksii*, var.) is indigenous, but not cultivated. Of other fibre-yielding plants, a species of *Sansevieria*, one of which produces the "bowstring hemp" of commerce, is used locally by the natives for making their fishing-nets, it grows freely along the banks of the Tamalakan and Botletli Rivers, as also does the new aloe (*Aloe Lugardiana*, Baker) described in *Kew Bulletin*, 1901, p. 135. There are many indigenous species of the genus *Indigofera*. But plants of economic value would seem to be sparsely represented.

A feature of much of the vegetation is its thorny nature; apart from the many species of thorny acacias and "wait-a-bit" thorn bushes (*Zizyphus mucronata*), which form in places an almost impenetrable thicket with every kind of straight and backward thorn, many of the smaller plants bristle with thorns on stem and branch, even on leaf, or calyx or seed-pod. Of most of the smaller plants the flowers are inconspicuous both as regards size and colouring, but there are several beautiful flowering-shrubs, e.g. *Bauhinia macrantha*, *Rhigozum linifolium*, *Catophractes Alexandri*; lilies (*Crinum and Pancratium*) in countless thousands, of which the new species (*Crinum rhodanthum*, Baker)—described in Dyer's *Flora of Tropical Africa*, vol. vii, p. 397, and illustrated in the *Botanical Magazine* for June 1901—is of exceptionally brilliant colouring; and a large number of species of *Hibiscus* of great beauty. *Gloriosa superba* is only found on the river banks. Attention may also be called to several new species of the interesting "carrion plants of South Africa" (*Stapelia* sp.), and to the two new species of *Ceropegia*. There are few representatives of the Orchidaceæ, but one new species (*Habenaria Lugardii*, Rolfe)—described in Dyer's *Flora of Tropical Africa*, vol. vii, p. 228, and illustrated in the *Botanical Magazine* for October 1901—is very beautiful; only one epiphytic orchid was discovered, *Ansellia africana* or *A. nilotica* or an allied species, which, though common in both East and West Africa, had never before been found so far south.

The light soil supports many grasses, belonging mainly to the genera *Andropogon* and *Aristida* (Dr. Schönland before S. A. Association, 1904), well-suited for stock, and of the grasses mentioned in the following List most of them would probably be of value for pasture. It would seem that for pastoral purposes alone is the country valuable. Away from the river-area, in these waterless and uninhabitable stretches of the Kalahari Desert, as Mr. Selous remarked in his recent paper before the African Society, the giraffe and other big game will find a safe retreat for many years to come, and the country will furnish a useful game reserve. Unfortunately the Kalahari wastes also form an unassailable breeding-ground for locusts, whence vast flights invade the Colonies of South Africa. Despite the destruction by European and native hunters, the Desert still affords asylum for most of the species of big game once found in countless herds all over the plains of South Africa down to the Cape. Herds of eland, blue wildebeest, gemsbuck and hartebeest, besides giraffe, are still found in the heart of the Desert; while within reach of the river-area zebra, koodoo, waterbuck, roan, tsessebi, impala, springbuck, bushbuck, and reedbuck are

common. The sable antelope is rare so far west. The duiker and steinbuck are met with everywhere. Hippo and crocodile are in all the rivers. Near the Chobi, baboons are in enormous numbers; warthog and bushpig are also numerous. Bird-life in the heart of the Desert is very scarce, but near the river-area, or in the vicinity of the desert water-pits, are found thousands of guinea-fowl, francolin, partridge and sandgrouse. Geese, both the spur-winged and the beautiful little Madagascar goose (*Nettapus madagascariensis*), and duck are in plenty on the rivers. The ostrich and the bustards are found far from water. Of the carnivora, the lion and the leopard and the smaller cats are only found within a comparatively short distance of the rivers, but the wild dog (*Lycaon pictus*) hunts far into the Desert.

Concluding Remarks.

Inaccessible, the greater part uninhabited and uninhabitable, Ngamiland can never be "a whiteman's country." The only Europeans now in the country, besides Government Police, are about half-a-dozen traders, and a few Boers in the Ghanzi veldt (S.W. of the Lake), the surviving remnant of the experimental Boer settlement, who eke out a precarious existence by "transport-riding." There are no European missionaries now resident in the country. Hitherto, despite great efforts, there has been a complete failure to discover mineral wealth, and, except as a pastoral country, and that only within a reasonable distance of the river-area, it is at present difficult to see of what value the country can be. There are those, however, who hold that accumulated subterranean supplies of water exist in the Desert, which, if tapped, would convert the land into one of the most fertile regions. Some hold that the solution of the problem lies in artesian wells, and that the Kalahari Desert may yet support stock-farming on a very large scale. (Cf Mr. J. F. Herbst's Report—Colonial Reports—Misc., No. 55, Oct. 1908, on the Southern Kalahari). The opening up of waters must rest with Government, who alone could face the cost of such an undertaking, which must always be most uncertain in results. Government has recently, in a small way, improved existing pits and opened others with fair success at the eastern end of the usual route across the Northern Kalahari from Palapye. But this route involves a journey of some 500 miles by ox-wagon from the railway to the Lake, half of which is across dreaded "thirsts," and the remainder along the Botletli Valley over terribly heavy sand in the dry season, and through a very malarious region during the rains. I understand it is in contemplation to open up a much shorter route to Ngamiland by the old hunter's track from Kanya (north of Mafeking), via Anderson's Vlei and Sebigo's post, reaching the Lake from the south. This would shorten the road by nearly 200 miles in distance, would avoid most of the heavy sand, and would be a far healthier route.

The possibilities of the Kalahari as a future stock-raising country depend entirely on success in opening up water-supplies. But, as regards the river area and adjacent country, there are possibilities for irrigation on a large scale. In this connection I

quote the last Official Report on the Bechuanaland Protectorate (Colonial Reports—Annual, No. 593 for 1907–8):—

"Irrigation at present is unknown and, so far as can be seen, will never be possible on a large scale except in that remote portion of the territory known as Ngamiland. There, a great river, the Okavango, flowing from the north, enters the Protectorate and gradually loses itself in marshes of vast extent. The annual volume of water which the Okavango carries is enormous, and to-day this element, so precious in South Africa, disappears in the middle of the sub-continent as completely as though it were discharged into the ocean. It is not too much to suppose that in the days to come the flow of the Okavango will be controlled, and that by a system of canals that region, to-day a desolate swamp, and many hundreds of square miles bordering upon it, may become land capable of the highest cultivation. Some day Ngamiland may be known as the Egypt of the South."

List of plants collected in Ngamiland and the northern part of the Kalahari Desert, chiefly in the neighbourhood of Kwebe and along the Botletle and Lake Rivers.

N. E. Brown.

This collection contains 320 Dicotyledons, 52 Monocotyledons and 2 Ferns, a total of 374 species, of which 92 are new. The general level of the region in which they were collected is 3,000 feet above sea-level, with hills rising a few hundred feet higher, since the highest elevation recorded on any of the labels is 3,600 feet. The specimens are all well selected, carefully preserved and mostly very complete, and are accompanied by valuable notes on the habit, colour of the flowers, &c. Mrs. Lugard also made a large series of very accurate coloured drawings with dissections, from which much aid has been obtained in preparing the following descriptions. From the notes on the labels the general composition of the Flora of the region appears to be somewhat as follows:—Trees about 29, varying from 15 to 40 feet in height; shrubs or bushes 44 or over; succulent plants about 15; annuals 58, but probably others that are not so indicated may belong to this group; thorny or prickly plants 17; climbing or twining plants about 30, besides many that scramble over bushes or rocks or creep on the ground; bulbs 20, and of Orchids only 2 were found. The remainder are mostly herbaceous perennials or shrublets. Most of the specimens are stated to flower during the rainy season, *i.e.* December to February, in March there is a very great and sudden decrease, only about one-fourth as many being recorded for that month as for each of the three preceding. In June about as many are recorded as for March, but during the remainder of the year only from 1 to 7 are noted as flowering in each month. Yellow is the predominating colour of the flowers, next in order come white, green, mauve, purple, cream, orange, pink, red, blue, greenish or greenish-white, magenta, claret and scarlet.

The new species and varieties contained in the collection which have already been published are indicated by a * and a reference to the place of publication is added.

Ranunculaceae.

Clematis brachiata, *Thunb.* var.
At Tsau, in Okavango Valley, 3,000 ft., *Lugard*, 229.

Nymphaeaceae.

Nymphaea stellata, *Willd.*
Botletle River, *Lugard*, 8; upper reaches of Botletle River, 3,000 ft., *Mrs. Lugard*, 7.
Flowers, some white, some mauve, some tinted with mauve.

Cruciferae.

Brassica Schimperi, *Boiss?*
Kwebe, in cultivated ground, flowers yellow, *Lugard*, 174.
The specimen collected by Capt. Lugard has the same small flowers as *B. Schimperi* (which was also collected in cultivated ground in Arabia and Abyssinia, by Schimper, Nos. 941 and 1099), and has similar fruit, but the leaves do not appear to have been quite so thick in substance and the stigma is not quite so large.

Capparidaceae.

Cleome hirta, *Oliv.*
Kwebe Hills, 3,300 ft., *Lugard*, 134, *Mrs. Lugard*, 130.
An erect annual 2–3 ft. high, with mauve or purple flowers. Whole plant sticky.

Cleome diandra, *Burch.*
Kwebe Hills, 3,300 ft., *Lugard*, 130, *Mrs. Lugard*, 191.
An annual 2–3 ft. high. Petals yellow, mauve at the base.

Cleome rubella, *Burch.*
Botletle Valley, *Lugard*, 189.
Flowers purple.

Cleome monophylla, *Linn.*
Kwebe, *Lugard*, 95.
Flowers whitish.

Gynandropsis pentaphylla, *D.C.*
Kwebe Hills, 3,300 ft., *Lugard*, 108, *Mrs. Lugard*, 75.
Annual, 2 ft. high, flowers white. Eaten by the Bushmen.

Maerua nervosa, *Oliv.* var. **flagellaris**, *Oliv.*
Kwebe Hills, *Lugard*, 135A.
Sepals and petals green, staminal-filaments greenish-white.

Maerua angolensis, *D C.* var.
Totin, near Lake Ngami, *Lugard*, 26, Kwebe Hills, 3,000–3,400 ft., *Mrs. Lugard*, 28.
An evergreen tree, 6 to 20 ft. high; flowers yellowish-brown and green.

Cadaba termitaria, *N. E. Br.*

Botletle River, *Lugard*, 2, at the foot of Kwebe Hills, 3,200 ft., *Lugard*, 71, *Mrs. Lugard*, 11.

A bush, growing to a height of 8 ft. Sepals green; nectary, gynophore and staminal-filaments red. Fruit green.

Boscia microphylla, *Oliv.*

Kwebe Hills and Kalahari, 3,000–3,500 ft., *Mrs. Lugard*, 27.

Evergreen tree of bushy nature; flowers green.

Capparis tomentosa, *Oliv.*

Lake River, *Lugard*, 18.

Grows as a creeper to a height of 20 ft. Flowers greenish-white; stamens reddish-brown, fruit dark red.

Violaceae.

Ionidium enneaspermum, *Vent.*

Kwebe Hills, 3,400 ft., *Lugard*, 106, *Mrs. Lugard*, 74.

Annual, flowers purple or crimson.

Polygalaceae.

Polygala abyssinica, *R. Br.* var?

Near Kwebe, *Lugard*, 84.

Flowers white.

Polygala ukambica, *Chodat.*

I am doubtful if this is specifically distinct from *P. Quartiniana*, A. Rich., as the very slight difference in the form of the auricle of the terminal lobe of the lateral or upper petals is scarcely more than one of variation. The figures of this species in Chodat's monograph are not correct.

Kwebe Hills, 3,400 ft., *Mrs. Lugard*, 100.

Plant growing to 1 ft. high. Lateral sepals at first pink, afterwards greenish, with a red margin. Very rare, only 3 plants found.

Portulaceae.

Portulaca kermesina, *N. E. Br.* *Herba* humilis, succulenta, perennis. *Caules* 10–15 cm. longi. *Folia* lineari-teretia, acuta, glabra, ad axillas longe pilosa. *Flores* terminales, 1·2 cm. diam., pulchre kermesini. *Petala* late elliptico-oblonga, acuta. *Stamina* 10. *Styli* 5.

A succulent perennial *herb*, with erect, glabrous stems 4–6 cm. high. *Leaves* alternate, $\frac{1}{3}$–$1\frac{1}{4}$ in. long, 1–$1\frac{1}{4}$ lin. thick, linear-terete, acute, fleshy, glabrous, with long white hairs in their axils. *Flowers* solitary, terminal, with an involucre of 5 long leaves. *Sepals* $\frac{1}{4}$ in. long, ovate, acute. *Petals* $\frac{1}{1}$ in. long. 2 lin. broad, elliptic-oblong, acute, bright carmine. *Stamens* 10; filaments carmine, anthers yellow. *Styles* 5, carmine.

Kwebe Hills, growing in loose sand, 3200 ft., *Mrs. Lugard*, 88.

Allied to *P. foliosa*, Ker, but distinguished by its red flowers and acute petals.

Talinum caffrum, *Eckl. & Zey.*

Kwebe Hills 3000–3500 ft., *Lugard*, 62, *Mrs. Lugard*, 60.

Flowers orange, opening towards evening only.

Talinum cuneifolium, *Willd.*
Botletle Valley, *Lugard*, 214.
Flowers bright magenta.

Talinum Arnotii, *Hook. f.*
Kwebe Hills, 3300 ft., *Lugard*, 109, *Mrs. Lugard*, 188.
A spreading plant with a tuberous rootstock, very succulent Flowers yellow.

Elatineae.

Bergia prostrata, *Schinz.*
B. pallidirosea, Gilg.
Botletle Valley, *Lugard*, 203. Rhodesia: at Shesheke on the Zambesi, *Kirk!* Angola: by the River Cunene, near Humba, 3600 ft. *Baum*, 98! German South-west Africa: at Orumbo on the White Nosob River, *Dinter*, 1336 (1335 ex. *Schinz*)!

Malvaceae.

Sida cordifolia, *Linn.*
Kwebe, *Lugard*, 235.

Sida rhombifolia, *Linn.*
Botletle Valley, *Lugard*, 192; Kwebe Hills, 3,200 ft., *Mrs. Lugard*, 167.
An erect perennial, growing to 2 ft. high. Flower pale orange.

Abutilon Lugardii, *Hochr. & Schinz.*
Kwebe Hills, 3,300 ft., *Lugard*, 148; *Mrs Lugard*, 171.
Plant 3–4 ft. high; leaves and calyx very viscid; flowers orange-yellow.

Abutilon fruticosum, *Guill. & Per.*
Kwebe Hills, *Mrs. Lugard*, 85.
An erect perennial, growing to 2 ft. high.

Pavonia macrophylla, *E. Mey.*
Kwebe Hills, 3,300 ft., *Lugard*, 138, *Mrs. Lugard*, 52, 66.
Perennial, 2–2½ ft. high; flowers lemon-yellow or orange.

Pavonia clathrata, *Mast.*
Kalahari Desert, near Malichwaë, *Lugard*, 231, between Kobis, and North Shaw Valley, *Baines!*

Hibiscus ternatus, *Mast.*
Kwebe Hills, 3,300 ft., *Lugard*, 115, *Mrs. Lugard*, 120.
Annual, growing to 1 ft. high; flowers yellow.

Hibiscus Trionum, *Linn.*
Botletle Valley, *Lugard*, 196.

Hibiscus caesius, *Garcke.*
Kwebe Hills, 3,300 ft., *Mrs. Lugard*, 118.
Plant growing to about 2 ft. high; flowers yellow, with a deep blood-red centre.

Hibiscus micranthus, *Linn.*
Kwebe Hills, 3400 ft., *Lugard*, 38, *Mrs. Lugard*, 50.
Plant 4–5 ft. high; flowers white, turning to pink when faded.

Hibiscus platycalyx, *Mast.*
Kwebe Hills 3,400 ft., *Lugard*, 147, *Mrs. Lugard*, 95.
A shrub 3–7 ft. high; the only shrubby *Hibiscus* of the locality; flowers yellow, with a dark chocolate-red centre.

Hibiscus dongolensis, *Del.*
Kwebe Hills, 3,300 ft., *Mrs. Lugard*, 113.
Plant $2\frac{1}{2}$ ft. high; flowers yellow, with a dull claret-coloured centre.

Hibiscus rhabdospermus, *Garcke.*
Kwebe Hills, 3,300 ft., *Mrs. Lugard*, 215.
An erect annual growing to 3 ft high; flowers pale yellow, with a claret-coloured centre.

Hibiscus Schinzii, *Gürke.*
A form with rather stouter stems and larger and less lobed leaves, but I think it is only a more luxuriant specimen than usual. It is very similar to *H. physaloides*, Guill. & Per., but the lobes of the leaves are much less acuminate and there are no glands exuding carbonate of lime on the underside of the leaves, so characteristic of that species.
Kwebe Hills, 3,000 ft., *Mrs. Lugard*, 112.
Growing to $1\frac{1}{2}$ ft. high, at first erect, then producing long side branches running on the ground; flowers yellow, with a blood-red centre.

Hibiscus Kirkii, *Mast.*
Kwebe Hills, 3,300 ft., *Mrs. Lugard*, 214.
An erect annual, growing to 3 ft. high, covered with adhesive prickly hairs; flowers deep lemon-yellow, with a blood-red centre.

Hibiscus diversifolius, *Jacq.*
Chobe River, 2,500 ft.? *Lugard*, 301.
A magnificent water-holyhock, growing erect to 12 ft. or more high in the main channel of the River Chobe, close to the bank. Flowers magenta?

Hibiscus cannabinus, *Linn.*
Kwebe Hills, 3,000 ft., *Mrs. Lugard*, 213.
An erect aunual, growing to 3 ft. high, found about swamps, very thorny; flowers pale yellow, with a rich claret-purple centre.

Fugosia digitata, *Pers.*
Kwebe Hills, 3,300 ft., *Mrs. Lugard*, 94.
A perennial, growing to 1 ft. high; flowers yellow, with a deep red centre having a fringe-like margin.

***Gossypium obtusifolium**, *Roxb.* var. **africana**, *Watt*, Wild and Cultivated Cotton Plants, p. 153, t. 23.
Kwebe Hills, 3,000 ft., *Mrs. Lugard*, 198.
A spreading bush, growing to 4 ft. high; flowers yellow, with a claret-coloured centre.

Sterculiaceae.

Melhania didyma, *Eckl. & Zey.*
Kwebe Hills, 3,400 ft., *Mrs. Lugard*, 123.
A dwarf bush, growing to 3 ft. high; flowers yellow.

Hermannia nyasica, *Baker*.
Okavango Valley, about 3,000 ft., *Lugard*, 236.
A bushy plant, growing to 4 ft. high; flowers pink.

Hermannia Lugardi, *N. E. Br.* *Herba* annua, erecta, brevissime glanduloso-pubescens. *Folia* petiolata, oblonga vel lineari-oblonga, subtruncata, breviter serrato-dentata, tenuiter stellato-pubescentia, *Pedicelli* 2·5 cm. longi, 1-flori. *Calyx* campanulatus; dentes deltoidei, acuminati. *Corolla* calyce subduplo longior, rosea.

An erect *annual*, 1–1¼ ft. high, loosely branching, shortly glandular-pubescent in all parts except the corolla, the glandular hairs on the leaves being very scattered. *Leaves* spreading, green; petiole 2⅓–6 lin. long; blade ¾–2¼ in. long, 2½–8 lin. broad, oblong or linear-oblong, subtruncate at the apex, more or less rounded at the base, shortly serrate-dentate, rather thinly stellate-pubescent on both sides. *Stipules* 1 lin. long, subulate. *Flowers* solitary in the axils of the uppermost leaves, forming a lax, terminal, leafy raceme. *Pedicels* 1 in. long, filiform, ebracteolate, jointed near the apex. *Calyx* campanulate, thinly glandular-pubescent; tube 1⅓–1½ lin. long; teeth 1¾ lin. long, deltoid, subulate-acuminate. *Corolla* about twice as long as the calyx, rosy-purple; petals 5½ lin. long, broadly obovate, obtuse, glabrous. *Stamens* 3½–3¾ lin. long, included, connivent; filaments broadly obovate, glabrous; anthers very acuminate, slightly hairy. *Capsule* subtruncate, shortly 10-horned, minutely pubescent.

Kwebe Hills, *Lugard*, 145, *Mrs. Lugard*, 125.

A very distinct species, which might, perhaps, be placed near *H. amabilis*, Marloth, from which it differs in its annual habit and leafy raceme.

Waltheria americana, *Linn.*
Kwebe Hills, 3,300 ft., *Lugard*, 142, *Mrs. Lugard*, 210.
Plant 1–2 ft. high; flowers yellow.

Tiliaceae.

Grewia villosa, *Willd.*
Kwebe Hills, 3,400 ft., *Lugard*, 46, *Mrs. Lugard*, 108.
Bush up to 4 ft. high; flowers russet or green; fruit reddish-brown.

Grewia salvifolia, *Heyne.*
Kwebe Hills, 3,300 ft., *Lugard*, 92B, *Mrs. Lugard*, 103.
Bush growing to 10 ft. high; flowers golden-yellow.

Grewia pilosa, *Lam.*
Kwebe Hills, 3,300 ft., *Mrs. Lugard*, 121.
Bush up to 10 ft. high; flowers golden-yellow.

Grewia grisea, *N. E. Br.* *Frutex* ramosus, ramulis fulvo-tomentosis. *Folia* breviter petiolata, oblonga, acuta, minute denticulata, utrinque cinereo-velutina. *Umbellae* axillares, 2–3-florae, velutino-tomentosae. *Sepala* lineari-oblonga, subacuta. *Petala* sepalis breviora, elliptico-oblonga, obtusa vel emarginata.

A branching *shrub* about 4 ft. high, the young shoots covered with a velvety fulvous tomentum, the older twigs becoming glabrous with a whitish bloom overlying a dark brown bark. *Leaves* spreading, with petioles 1–1½ lin. long, fulvous-tomentose;

blade about 2 in. long, 9–10 lin. broad, oblong, acute, rounded and slightly unequal at the base, denticulate with minute regular obtuse teeth, both sides covered with a close velvety greyish tomentum, but paler beneath; stipules 4–5 lin. long, ½–¾ lin. broad, linear-lanceolate, subulate-acuminate. *Umbels* 2–3-flowered. *Peduncle* 1½–3 lin. long, fulvous-velvety. *Pedicels* 1½–2 lin. long, greyish-velvety. *Buds* oblong, not constricted at the middle. *Sepals* 3½–4 lin. long, ¾ lin. broad, linear oblong, hooded at the subacute apex, greyish-velvety outside, glabrous within. *Petals* much shorter than the sepals, about 2½ lin. long, 1⅓ lin. broad, elliptic-oblong, obtuse or emarginate, with a large gland on the claw, yellow; gland surrounded by a tomentose border, which is free from the petal at the obtusely rounded apex. *Torus* not longer than the glands, about ½ lin. long, glabrous, fringed with hairs at the apex. *Stamens* glabrous. *Ovary* adpressed-hairy, 2-celled; style shortly exceeding the stamens; stigma much dilated, 5-lobed. *Fruit* not seen.

Kwebe, *Lugard*, 54.

Allied to *G. salvifolia*, Heyne, but distinguished by its acute or very acute (not obtuse) leaves, with a close velvety grey tomentum on the upper side, and more numerous primary veins.

Grewia kwebensis, *N. E. Br.* *Frutex* ramosus, ramulis griseo-tomentosis. *Folia* breviter petiolata, elliptico-oblonga, obtusa, minute denticulata, supra glabra, subtus cinereo-velutina. *Umbellae* axillares, pedunculatae, 2–3-florae. *Sepala* lineari-oblonga, subobtusa. *Petala* sepalis breviora, lineari-oblonga, apice emarginata.

A *bush* about 6 ft. high, the young branchlets covered with a greyish velvety tomentum. *Leaves* spreading; petiole 1½–2 lin. long, somewhat fulvous-velvety; blade 1–3 in. long, ¾–1¾ in. broad, elliptic or elliptic-oblong, obtuse, equal or slightly unequal at the base, minutely denticulate, glabrous above, with a close velvety whitish-grey tomentum beneath; stipules 3–5 lin. long, ⅓–½ lin. broad, linear-subulate. *Umbels* axillary, pedunculate, 2–3-flowered. *Peduncles* 6-8 lin. long, greyish-velvety. *Bracts* similar to the stipules, very deciduous. *Pedicels* 4–6 lin. long, greyish-velvety. *Buds* oblong, obtuse, not constricted at the middle. *Sepals* 5–5½ lin. long, 1 lin. broad, linear or linear-oblong, hooded at the subobtuse apex, greyish-velvety outside, glabrous within. *Petals* shorter than the sepals, about 3½ lin. long, 1 lin. broad, linear-oblong, emarginate at the apex, with a large hairy-margined gland on the claw, yellow. *Torus* about ½ lin. long, glabrous below, densely pubescent at the apex. *Stamens* glabrous. *Ovary* pubescent or subtomentose; style shortly exceeding the stamens, glabrous; stigma much dilated obscurely lobed. *Fruit* not seen.

Kwebe, *Lugard*, 92.

Allied to *G. salvifolia*, Heyne, but is readily distinguished by its larger leaves and flowers, and longer peduncles.

Grewia subspathulata, *N. E. Br.* *Frutex* ramosus, ramulis fulvo-tomentosis. *Folia* breviter petiolata, elliptico-oblonga, acuta, serrulata, supra pilis minutis stellatis velutina, subtus cinereo-velutina. *Umbellae* axillares, pedunculatae, 2–3-florae, velutinae. *Sepala* lineari-oblonga, subobtusa. *Petala* sepalis breviora, spathulato-obovata, apice emarginata.

A branching *shrub*; young branchlets and petioles covered with a fulvous velvety tomentum intermingled with tufts of longer hairs; older twigs glabrous, greyish. *Leaves* spreading; petiole 1½–2 lin. long; blade 1¼–2½ in. long, ¾–1¼ in. broad, elliptic-oblong, acute, rounded and slightly unequal at the base, somewhat irregularly serrulate on the margin; upper surface covered with a minute stellate pubescence, somewhat velvety to the touch; under surface with a very dense whitish-grey velvety tomentum; stipules 3½–4 lin. long, linear-subulate, velvety. *Umbels* axillary, pedunculate, 2-3-flowered, velvety like the branchlets. *Peduncles* solitary or 2–3 together, 3–7 lin. long. *Bracts* similar to the stipules, caducous. *Pedicels* 3 lin. long. *Buds* oblong, obtuse, not constricted at the middle. Sepals 5–5½ lin. long, 1–1½ lin. broad, linear-oblong, hooded at the obtuse apex, velvety outside, glabrous within. *Petals* shorter than the sepals, 3–4 lin. long, 1¼–1⅔ lin. broad, spathulate-obovate, emarginate at the apex, with a large, orbicular, hairy-margined gland on the claw. *Torus* 1 lin. long, glabrous below, densely pubescent at the apex. *Stamens* glabrous. *Ovary* tomentose; style slightly exceeding the stamens, glabrous; stigma much dilated, slightly lobed. *Fruit* not seen.

Kwebe, *Lugard*, 92*a*.

This species somewhat resembles *G. pilosa*, Lam., but is readily distinguished by the whitish-grey under-surface of the leaves. The stellate hairs on the upper side of the leaves, although forming a velvety surface, have distinct spaces between them, allowing the green surface to appear, and are not densely interwoven as in *G. grisea*, N. E. Br.

Grewia cordata, *N. E. Br.* *Frutex* ramosus, ramulis fulvo tomentosis. *Folia* breviter petiolata, ovato-cordata, acuta vel subobtusa, serrato-dentata, supra viridia, pilis fasciculatis sparsim pubescentia, subtus albido-velutina. *Umbellae* axillares, pedunculatae, 2–3-florae, fulvo-tomentosae. Sepala oblonga, subobtusa. *Petala* sepalis breviora, cuneato-oblonga, apice emarginata, lutea.

A *bush* growing to a height of 10 ft.; young branchlets covered with a dense and somewhat villose or shaggy fulvous tomentum, older twigs glabrous, greyish. *Leaves* very shortly petiolate, 1¼–2½ in. long, 1–1¾ in. broad, ovate-cordate, acute or subobtuse, serrate-dentate, with small, somewhat irregular teeth; upper surface green, with scattered fasciculate hairs; under surface with a close velvety whitish-grey tomentum, the nerves and petiole fulvous; stipules 3–4 lin. long, linear-lanceolate, acute, fulvous. *Umbels* axillary, solitary or in pairs, pedunculate, mostly 3-flowered, fulvous-tomentose, erect. *Peduncle* ½ in. long. *Bracts* similar to the stipules, caducous. *Pedicels* 2½–3 lin. long. *Buds* ellipsoid. Sepals 4 lin. long, 1½ lin. broad, oblong, slightly hooded at the subobtuse apex, yellow. *Petals* 2½–3 lin. long, ¾–1 lin. broad, cuneate-oblong, emarginate or obtusely bfiid at the apex, glabrous, yellow. *Stamens* glabrous, orange-yellow. *Ovary* villose-tomentose; style glabrous, exceeding the stamens; stigma dilated, lobed. *Fruit* hairy.

Kwebe Hills, 3,300 ft., *Mrs. Lugard*, 102.

Allied to *G. monticola*, Sond., but readily distinguished by its larger, cordate leaves, and different indumentum.

Grewia calycina, *N. E. Br.* *Frutex* ramosus. *Rami* pilis fasciculatis breviter villosi. *Folia* brevissime petiolata, elliptica, utrinque obtusa, crenulato-denticulata, utrinque pubescentia et viridia. *Umbellae* foliis oppositae, prope apices ramorum, pedunculatae, 2–3-florae, pilis fasciculatis molliter pubescentes. *Bracteae* subpalmatisectae. *Sepala* auguste lanceolata, acuta. *Petala* minima, ovata.

A "*scrub bush*," young branches shortly villous with fasciculate hairs. *Leaves* somewhat ascending; petiole about 1 lin. long; blade $\frac{3}{4}$–$1\frac{3}{4}$ in. long, $\frac{1}{2}$–$1\frac{1}{4}$ in. broad, elliptic, obtuse, and often broadly rounded at the apex, rounded at the base, crenulate, green and softly pubescent on both sides; stipules 2–3 lin. long; linear-filiform. *Umbels* subopposite the leaves, near the apex of the branches, erect, pedunculate, 2–3–flowered, softly pubescent with fasciculate hairs. *Peduncles* 3–4 lin. long. *Bracts* 3–4 lin. long, deeply divided into linear-filiform segments. *Pedicels* 3–4 lin. long. *Sepals* 7–8 lin. long, $1\frac{1}{2}$–2 lin. broad, narrowly lanceolate, acute, campanulately spreading, white inside, green and pubescent with fasciculate hairs on the outside. *Petals* very small, $1\frac{1}{2}$ lin. long, 1 lin. broad, ovate, furnished with a large orbicular gland with a pubescent border, that occupies the greater part. *Torus* about $1\frac{1}{4}$ lin. long, glabrous in the lower third, velvety-tomentose above. *Stamens* glabrous. *Ovary* densely covered with rather long hairs; style exceeding the stamens, glabrous; stigma dilated. *Fruit* not seen.

Botletle Valley, *Lugard*, 237.

Allied to *G. hispida*, Harv., differing in its divided bracts, minute petals, and other characters.

Triumfetta pentandra, *A. Rich.*

Kwebe Hills, 3,300 ft., *Mrs. Lugard*, 206.

An erect annual, growing to 18 in. high; flowers yellow.

Corchorus tridens, *Linn.*

Kwebe Hills, 3,300 ft., *Lugard*, 113; *Mrs. Lugard*, 209.

Plant up to 2 ft. high; flowers yellow.

Corchorus asplenifolius, *Burch.*

Kwebe Hills, 3,300 ft., *Lugard*, 118; *Mrs. Lugard*, 115.

A perennial up to 8 in. high; flowers yellow.

Malpighiaceae.

Sphedamnocarpus pruriens, *Pl.*

Northern Kalahari Desert; near Inkonani Pits, 3,000 ft., *Lugard*, 291.

A creeper or twiner; flowers bright yellow; fruit pinkish-green.

Triaspis hypericoides, *Burch.* **var.**

Kalahari Desert; at T'Klakane Pits, 2,500 ft., *Lugard*, 304.

Scrub-bush growing to 5 ft. high; flowers pinkish-purple; fruit with brown wings.

Zygophylleae.

Tribulus terrestris, *Linn.*

Kwebe Hills, 3,300 ft., *Lugard*, 105, 123; *Mrs. Lugard*, 117.

Annual, growing to 12 in. high (*Mrs. Lugard*), ground creeper (*Lugard*); flowers yellow.

Geraniaceae.

Monsonia biflora, *DC.* var.
Kwebe Hills, 3,300 ft., *Lugard*, 117 ; *Mrs. Lugard*, 69.
Dwarf perennial, 6 in. high ; flowers white.

Monsonia senegalensis, *Guill. & Per.*
Kwebe Hills, 3,300 ft., *Lugard*, 110, 153 ; *Mrs. Lugard*, 173.
A spreading annual ; flowers pink, with darker veins (*Mrs. Lugard*), purple (*Lugard*).

Burseraceae.

Commiphora kwebensis, *N. E. Br.* *Frutex* vel arbuscula inermis ; ramuli minute cinereo-velutini. *Folia* trifoliolata vel imparipinnata, 2-juga, petiolo 0·6–5 cm. longo ; foliola lateralia elliptica vel elliptico-oblonga, utrinque obtusissima, terminalia basi longe et acute cuneata, crenato-serratula, supra tenuissime et minutissime pubescentia, subtus in nervis minute pubescentia. *Flores* subfasciculati, parvi ; pedunculi 1–3-flori. *Drupa* ellipsoidea.

A spineless much branched *shrub* or *small tree*, 4–15 ft. high, dioecious. *Branches* widely divergent, minutely grey-velvety, becoming glabrous, with a dark brown bark. *Leaves* trifoliolate or pinnately 5-foliolate, when very young densely pubescent with minute hairs or softly villous with longer hairs on the petiole and both surfaces, when adult with a minute pubescence on the petioles and veins of the under surface and thinly scattered on the upper surface ; petiole of adult leaves (up to the terminal leaflet) $\frac{1}{4}$–2 in. long ; lateral leaflets $\frac{1}{4}$–1 in. long, 2–7 lin. broad, elliptic or elliptic-oblong, very obtuse at both ends, unequal-sided at the base, sessile ; terminal leaflet elliptic-obovate, obtuse, cuneately narrowed from a little below the middle to a very acute base, all finely crenate-serrulate, thin. *Male flowers* usually subfasciculate, with 1–3-flowered pubescent or shortly villous peduncles 1–3 lin. long, or occasionally one or more of the peduncles up to 8–10 lin. long ; bracts $\frac{3}{4}$–$1\frac{3}{4}$ lin. long, filiform, pubescent ; pedicels 1–$2\frac{1}{2}$ lin. long, pubescent or shortly villous ; calyx 2 lin. long, campanulate, tapering to the base, 4–5-lobed to nearly half way down, pubescent ; lobes deltoid-ovate, subacute, erect ; petals 4, perigynous, about $1\frac{1}{2}$ lin. long, $\frac{3}{4}$ lin. broad, oblong obtuse, glabrous, greenish-yellow ; stamens 8, perigynous, inserted with the petals at the margin of the disk which lines the calyx-tube almost to its top, unequal, the 4 longer alternating with the petals ; ovary none. *Female flowers* solitary, pedicels 1–$1\frac{1}{2}$ lin. long ; calyx $1\frac{1}{3}$ lin. long, campanulate, broad-based ; petals $1\frac{1}{3}$ lin. long, $\frac{1}{2}$ lin. broad ; stamens rudimentary, the longer $\frac{1}{3}$–$\frac{1}{2}$ lin. long ; disk very short, fleshy, 8-crenate ; ovary ovoid, narrowed into a very stout style $\frac{1}{4}$ lin. long ; stigma large, 2-lobed, otherwise as in the male. *Drupe* ellipsoid, 7 (in the dried state, 5) lin. long, 6 (in the dried state, 4) lin. in diam., bright red ; no aril-like body around the bony compressed endocarp.

Kwebe Hills, 3,400 ft., *Lugard*, 86 ; *Mrs. Lugard*, 34.

This species appears to be nearest allied to *C. Rehmanni*, Engl.

Mrs. Lugard notes that the male and female trees are separate, and that they start flowering before the leaves appear and continue

in flower long after the leaves develop. The trees flower in December and the fruit ripens in February.

Commiphora Lugardae, *N. E. Br.* *Arbor* usque 6 m. alta, spinescens. *Folia* simplicia vel 3-foliolata, obovata, serrata, glabra; foliola lateralia parva minima vel obsoleta. *Flores* masculi subcymoso-fasciculati, feminei subsessiles, rubescentes. *Drupa* globosa, rubra, mesocarpo arillum simulante coccineo in lobos 4 lineares diviso.

A thorny *tree* growing to a height of 20 ft., dioecious, flowering before the leaves appear, and exuding "quantities of soft pink and white gum, standing out in knobby balls." *Branchlets* ending in spines. *Leaves* fascicled, subsessile or very shortly petiolate, simple or trifoliolate; lateral leaflets, when present, 1–7 lin. long, $\frac{2}{3}$–5 lin. broad; middle leaflet 1–3 in. long, $\frac{1}{2}$–$1\frac{1}{2}$ in. broad; all obovate, cuneately much attenuated at the base, very broadly rounded at the apex, serrate in the upper part, quite glabrous. *Male flowers* subcymose-fasciculate. *Peduncle* $\frac{1}{2}$–2 lin. long, puberulous. *Pedicels* $\frac{1}{2}$–1 lin. long, puberulous. *Bracts* minute. *Calyx* $1\frac{1}{3}$–$1\frac{1}{2}$ lin. long, shortly 4-toothed, puberulous; teeth subobtuse. *Petals* $2\frac{1}{2}$ lin. long, $\frac{1}{2}$ lin. broad, linear, acute, erect, recurved at the apex, glabrous, reddish outside, greenish within. *Stamens* 8, biseriate, included, the alternate ones longer. *Disk* annular. *Female flowers* subsessile, fascicled, resembling the male flowers except that they are rather smaller, more ovoid and the petals are scarcely recurved at the apex; their stamens are abortive and about $\frac{1}{2}$ lin. long. *Ovary* ovoid, narrowed into a short style, glabrous, 2-celled; ovules 2 in each cell. *Drupe* globose, 4–5 lin. in diam., red when ripe; epicarp fleshy; mesocarp transformed into a bright red aril-like body with 4 linear-terete lobes embracing the bony globose endocarp.

Kwebe Hills, 3,000–3,500 ft., *Mrs. Lugard*, 23.

According to Mrs. Lugard's note, this is said to be a poisonous tree, and "as far as observed in the plains never attains to a greater size than scrub bush." Possibly the plant of the plains, which I have not seen, may be a different species.

Olacineae.

Ximenia americana, *Linn.*

Botletle River and Kwebe Hills, 3,000–3,300 ft., *Mrs. Lugard*, 3.

Thorny bush, up to 20 ft. high; flowers green; fruit 9–10 lin. in diam., bright yellow.

Ximenia caffra, *Sond.*

Kwebe Hills, 3,200 ft., *Mrs. Lugard*, 58.

A bush, up to 5 ft. high, slightly thorny; flowers white (owing to the very dense bearding of white hairs upon the green petals); fruit 13–15 lin. in diam., scarlet.

Celastraceae.

Hippocratea parviflora, *N. E. Br.* *Frutex* scandens. *Folia* lanceolata, obtusa, basi cuneato-angustata, obscure denticulata, supra tenuiter et minutissime puberula, subtus molliter pubescentia. *Cymae*

axillares, dichotome ramosae, multiflorae, pubescentes. *Flores* minuti, virides.

A climbing *shrub* with a greyish bark. *Leaves* opposite, $1\frac{1}{2}$–$2\frac{3}{4}$ in. long, 7–11 lin. broad, lanceolate, narrowed to an obtuse point and tapering at the base into a 2–3 lin. long petiole, obscurely denticulate, thinly and minutely puberulous on the upper side, softly pubescent beneath. *Cymes* from both axils, $1\frac{1}{4}$–$2\frac{1}{2}$ in. long and broad, dichotomously branched, many-flowered, pubescent. *Bracts* minute. *Pedicels* $\frac{1}{2}$–1 lin. long. *Flowers* minute, green. *Sepals* $\frac{1}{6}$ lin. long, obtuse, pubescent. *Petals* $\frac{2}{3}$ lin. long, $\frac{1}{4}$ lin. broad, oblong, obtuse, glabrous. *Stamens* 3, white, $\frac{1}{4}$ lin. long. *Fruit* not seen.

Kwebe Hills, 3,300 ft., *Mrs. Lugard*, 180.

Rhamnaceae.

Zizyphus mucronata, *Willd.*

Kwebe, *Lugard*, 122 ; *Mrs. Lugard*, 31.

Tree, growing to 15 ft. high ; flowers green.

Berchemia discolor, *Hemsl.*

Kwebe Hills, 3,300 ft., *Mrs. Lugard*, 33.

Tree, growing to 30 ft. high ; flowers green.

Helinus mystacinus, *E. Mey.*

Kwebe Hills, 3,300 ft., *Lugard*, 157 ; *Mrs. Lugard*, 79.

A dwarf shrub or creeper ; flowers green.

Ampelideae.

Vitis congesta, *Baker*, var.

Kwebe Hills, 3,300 ft., *Lugard*, 187 ; *Mrs. Lugard*, 197.

Creeps much over rocks ; foliage succulent ; flowers green or greenish-white.

Sapindaceae.

Cardiospermum canescens, *Wall.*

Kwebe Hills, 3,400 ft., *Lugard*, 104 ; *Mrs. Lugard*, 122.

A creeper, flowers pale yellow according to Lugard, white with a deep yellow stigma according to Mrs. Lugard's drawing ; fruit green.

Anacardiaceae.

Rhus kwebensis, *N. E. Br.* *Frutex* usque 2·1 m. alta, dioica. *Folia* petiolata, trifoliolata, foliolo intermedio sessili elliptico-oblongo obtuso basi cuneato-acuto grosse crenato, lateralibus duplo minoribus ellipticis basi obtusis vel rotundatis. *Paniculae* axillares et terminales, multiflorae, pubescentes.

A *bush*, growing to a height of 7 ft., dioecious. *Branchlets* greyish-tomentose. *Leaves* petiolate, trifoliolate, softly pubescent on both sides ; petiole 3–10 lin. long, tomentose ; middle leaflet sessile, 1–$2\frac{1}{4}$ in. long, $\frac{2}{3}$–$1\frac{1}{2}$ in. broad, elliptic-oblong, very obtuse, broadly cuneate at the acute base, coarsely crenate ; lateral leaflets similar but only half as large and somewhat obtuse or rounded at the base. *Panicles* axillary and terminal, many-flowered, pubescent. *Flowers* $1\frac{1}{2}$ lin. in diam., green. *Sepals* $\frac{1}{4}$ lin. long and broad, rounded,

pubescent. *Petals* nearly $\frac{2}{3}$ lin. long, $\frac{1}{3}$ lin. broad, oblong, obtuse, glabrous. *Stamens* 5, inserted at the margin of the disk, rudimentary in the female flowers. *Ovary* inserted on a large disk, globose, glabrous.

Kwebe Hills, 3,300 ft., *Mrs. Lugard*, 200.

Allied to *R. Rehmanniana*, Engl., differing in its inconspicuously reticulated and coarsely crenate-toothed leaves and larger flowers.

Sclerocarya caffra, *Sond.*

Kwebe Hills, 3,300–3,500 ft., *Mrs. Lugard*, 38.

Trees, male and female, growing to 40 ft. high ; flowers pink to maroon ; fruit green, like a large plum, enclosing a hard three-eyed stone.

Leguminosae.

Crotalaria spartioides, *DC.*

Kalahari Desert ; near Malichwae, *Lugard*, 232.

Plant, 3 ft. high, like "Broom ;" flowers bright yellow.

Crotalaria incompta, *N. E. Br.* *Herba* minutissime pubescens, ramis angulatis. *Folia* simplicia, petiolata, lineari-lanceolata, acuta, supra glabra. *Racemi* laterales, 2–4 flori. *Corolla* lutea, glabra, carina acutissima.

A *herb*, 1–1$\frac{1}{2}$ ft. high, branching from the base upwards, very minutely and thinly pubescent with adpressed hairs, except on the corolla and upper surface of the leaves ; branches more or less angular, erect. *Leaves* rather distant, petiolate, simple ; petiole 4–6 lin. long ; blade 1–3$\frac{1}{2}$ in. long, 1$\frac{1}{2}$–4 lin. broad, linear-lanceolate or linear, acute, somewhat rounded at the base, glabrous above ; stipules $\frac{2}{3}$–1 lin. long, subulate. *Racemes* lateral at the nodes, pedunculate, 4-flowered, shorter than the leaves, varying from 1–2$\frac{1}{2}$ in. long, of which one quarter to half the length is peduncle. *Bracts* $\frac{1}{2}$–$\frac{3}{4}$ lin. long, subulate. *Pedicels* 2 lin. long. *Calyx-tube* about $\frac{3}{4}$ lin. long, broadly campanulate ; teeth subequal, 1$\frac{1}{2}$ lin. long, narrowly elongated-deltoid, acute. *Corolla* glabrous, yellow, 3 lin. long ; keel abruptly bent at a right angle at the middle, very acute.

Botletle Valley, *Lugard*, 205.

In foliage this species resembles *C. Vogelii*, Benth., but it is much more glabrous, and the lateral few-flowered racemes at once distinguish it.

Crotalaria flexuosa, *Baker.*

Kwebe Hills, 3,300 ft., *Lugard*, 133 ; *Mrs. Lugard*, 179.

Plant, 1–2 ft. high ; flowers yellow.

Crotalaria platysepala, *Harv.*

Kwebe Hills, 3,200 ft., *Lugard*, 158 ; *Mrs. Lugard*, 178.

Okavango Valley, 3,000 ft., *Lugard*, 238 ; banks of the Tamalakane and Zouga Rivers, *McCabe*, 8 ; in sandy soil between the rivers beyond the Lake (Ngami) and also by the sides of the Rivers Chobe and Tamalakane, *McCabe*, 11.

An erect annual, 1$\frac{1}{2}$–3 ft. high ; flowers bright yellow.

Indigofera daleoides, *Benth.*

Kwebe Hills, 3,300 ft., *Mrs. Lugard*, 194.

A spreading annual ; flowers carmine.

Indigofera hirsuta, *Linn.* **var.**
Kwebe Hills, 3,400 ft., *Lugard*, 135*a* ; *Mrs. Lugard*, 127.
An erect annual, growing to 14 in. high ; flowers pink.

Indigofera flavicans, *Baker.* This species was originally described from a very fragmentary specimen, and its close resemblance to *I. diphylla*, Vent., has not hitherto been noticed. Although Mr. E. G. Baker in his monograph of the Tropical African species (*Journal of Botany* 1903, p. 191) states that it is "an ally of *I. diphylla*," yet he separates them widely in his arrangement of the species and includes some specimens of *I. flavicans* under *I. diyhylla*, Vent. Indeed, the two species have hitherto been confused, but may easily be recognised by the following characters: — In *I. diphylla*, the racemes (either in flower or fruit) are not more than 1 inch long and are subsessile or with a very short peduncle, and the pods gradually taper into a stout beak-like style, which is as long as the seed-bearing part and abruptly curved at the base, so that the entire fruit is curved nearly in a semicircle. In *I. flavicans* the racemes are $1\frac{1}{2}$–$2\frac{1}{2}$ in. long, including the very distinct peduncles $\frac{1}{3}$–$\frac{3}{4}$ of an inch in length, and the pod somewhat abruptly tapers into a much more slender style not more than half as long as the seed-bearing part, which, together with the base of the style is straight, only the glabrous apical part of the style being incurved-hooked ; the leaves are also larger in *I. flavicans*, otherwise the two species are very much alike and should be placed next each other. *I. diphylla* seems confined to the northern part and *I. flavicans* to the southern part of Tropical Africa. The following specimens of *I. flavicans* are contained in the Kew Herbarium :—

South Tropical Africa, *Baines*. Angola : by the River Longa, *Baum*, 668. Amboland : Olukonda, *Rautanen*, 216 ; Omupanda, *Wulfhorst*, 27. Ngamiland : Kwebe Hills, *Lugard*, 146, *Mrs. Lugard*, 190 ; Botletle Valley, *Lugard*, 197. Bechuanaland : Eastern Bamanguato Territory, *Holub*, 1098. Portuguese East Africa : Chiloane, *Scott* ; Mozambique, *Peters*.

Stems spreading, creeping over the sand ; flowers purple or deep pink.

Indigofera dentata, *N. E. Br.* *Annua*, erecta, ramosa, pilis medio affixis parce adpresse pubescens. *Folia* pinnata ; foliola 5–7, opposita, 1·8 -5 cm. longa, 6–14 mm. lata, lanceolata-oblonga, obtusa, integra vel dentata. *Racemi* foliis longiores, pedunculati. *Calyx* parvus ; tubus oblique cupularis, inaequaliter 5-dentatus. *Corolla* purpurea, glabra. *Legumen* lineari-teres.

An erect branching *annual*, 12–14 in. high, thinly clothed on the stem, petioles, both sides of the leaves, calyx and pods, with adpressed, centrally attached hairs. *Leaves* 1–5 in. long, including the $\frac{1}{3}$–1 in. long petiole, the lowest trifoliolate, the rest imparipinnate, with 2–3 pairs of opposite leaflets and a terminal one, $\frac{3}{4}$–2 in. long, 3–7 lines broad, lanceolate-oblong, obtuse or truncate, entire or variably toothed, green, paler beneath ; stipules about $\frac{1}{4}$ in. long, subulate. *Racemes* axillary, longer than the leaves, erect, many- (20- or more-) flowered ; peduncle $1\frac{1}{2}$–$1\frac{3}{4}$ in. long ; flowering part elongating and the flowers becoming rather distant, 2–5 in. long.

Bracts 1–1½ lin. long, subsetaceous, exceeding the buds and recurved. *Calyx* small; tube ½ lin. long, obliquely cup-shaped, 5-toothed; the 2 upper teeth about ¼ lin. long, deltoid; the 3 lower teeth ½ lin. long, subulate. *Corolla* glabrous, 3½ lin. long; vexillum ovate, acute, pale mauve, with darker veins and having two whitish spots at the base; alae slightly ovate-oblong, obtuse, mauve-purple; keel obtuse. *Pods* (immature) erect, linear-terete. *Seeds* several.

Kwebe Hills, 3,400 ft., *Mrs. Lugard*, 128; *Lugard*, 135.

A very distinct species, with something of the aspect of *I. trita*, L. f., but quite distinct in foliage, flowers and the erect pods. The toothed leaflets are very remarkable, although they do not appear to be quite constant, some specimens having all the leaflets entire, and in the examples I have seen the toothed leaflets are never so numerous as the entire ones, and yet are evidently quite normal.

***Indigofera variabilis**, *N. E. Br.* in Journ. Bot., 1903, p. 192.† *Frutex* 90 cm. altus, ramis albidis. *Folia* brevissime petiolata, simplicia vel 3-foliolata; foliola 6–16 mm. longa, cuneato-obovata, obtusa, recurvato-apiculata, utrinque appresse subcanescentia. *Racemi* foliis multo breviores, 2–5-flori, subsessiles. *Calyx* vix 2 mm. longus, canescens; lobi subulati. *Corolla* 5 mm. longa. *Legumen* 7 mm. longum, teres.

A bushy *shrub*, 2–3 ft. high, the young branchlets densely clothed with adpressed white hairs, slightly rough to the touch. *Leaves* simple or trifoliolate with petioles scarcely ½ lin. long; leaflets 3–8 lin. long, 1½–2½ lin. long, narrowly cuneate-obovate, obtuse, with a recurved apiculus, longitudinally folded, adpressed-canescent on both sides, rather thinly in the older leaves. *Racemes* about half as long as the leaves, 2–5-flowered. *Calyx* scarcely 1 lin. long, with a shallow, bowl-shaped tube, and 5 subulate teeth, canescent. *Corolla* 2½ lin. long, bright red or pink, adpressedly pubescent on the vexillum and keel. *Legume* 3½ lin. long, terete, canescent. *Seeds* several.

Kwebe Hills, 3,400 ft., *Lugard*, 99; *Mrs. Lugard*, 119.

This species is, perhaps, more nearly allied to *I. pungens*, E. Mey., and *I. pulchra*, Vahl, than to any others; from the first it is distinguished by its variable leaves, short racemes, and indumentum; and from *I. pulchra* by its more shrubby habit, and different corolla, which is about three times as long as the calyx.

Tephrosia reptans, *Baker*.

Kwebe Hills, 3,300 ft., *Lugard*, 152; *Mrs. Lugard*, 175.

Annual, 1½–3 ft. high; flowers pinkish-mauve.

Tephrosia Apollinea, *DC.*

Kwebe Hills, 3,300 ft., *Mrs. Lugard*, 150.

Growing to 15 in. high; flowers carmine.

Tephrosia contorta, *N. E. Br.* *Frutex* ramosus; rami virgati, dense albo-tomentosi. *Folia* trifoliolata, foliolis cuneato-oblongis recurvato-apiculatis. *Flores* axillares, fasciculati, purpurei. *Legumen* spiraliter contortum, villoso-tomentosum.

A *shrub* with straight twig-like branches, clothed with a dense white tomentum. *Leaves* trifoliolate, ascending; petiole ½–1½ lin. long

† As only a very brief diagnosis was published at the place quoted, I here give a more complete description.

tomentose; leaflets 1–1½ in. long, 2½–5½ lin. broad, cuneate-oblong, obtuse, with a recurved hook-like apiculus, glabrous above, pubescent beneath with adpressed silky white hairs. *Flowers* axillary, fasciculate. *Calyx* 2–2½ lin. long, villous with fulvous hairs, 5-toothed to the middle: teeth subulate. *Corolla* 3½ lin. long, purple; standard pubescent on the back. *Legume* flat, twisted into one loose spiral, densely villous-tomentose with white hairs.

Kwebe, *Lugard*, 132.

A very distinct species, allied to *T. plicata*, Oliv., of Natal and the Transvaal, but the legume is twisted into a spiral instead of plicately folded, and the flowers are larger.

Mundulea suberosa, *Benth.*

Near Kwebe, *Lugard* 73; Kalahari Desert; Chukutsa Salt-pan and T'Klakane Pits, about 2,300 ft., *Lugard*, 302; between the Zuga River and Lichuana's Country, and also on the River Tamalakane, *McCabe*, 2; and without precise locality, *McCabe*, 43.

A bushy shrub, 4–6 ft. high, with purple flowers according to. Lugard, and according to McCabe pinkish-yellow or pinkish and purple.

Sesbania punctata, *DC.* var.

Kwebe Hills, 3,300 ft., *Lugard*, 161, 161A; *Mrs. Lugard*, 168.

An erect annual, 4–5 ft. high, growing in swampy ground; flowers yellow speckled with black; leaves closed at night.

Aeschynomene indica, *L.*

Kwebe Hills, 3,300 ft., *Mrs. Lugard*, 219.

An erect annual, growing to 4 ft. high; flowers yellow.

Galactia Lugardi, *N. E. Br.* *Herba* longe procumbens, sparsim adpresse pubescens. *Folia* petiolata, pinnatim 3-foliolata; foliolum intermedium rhomboideo-lanceolatum, acutum; foliola lateralia oblique lanceolata, acuta. *Racemi* 15–17·5 cm. longi, pedunculati, laxi. *Flores* bini vel terni, purpurei. *Calyx* 7 mm. longus; lobi 2 superiores ad medium connati, laterales oblongi, omnes obtusi; lobus infimus paulo longior, acutus. *Corolla* 1 cm. longa, glabra; carina obtusa.

A *herb*, with long creeping stems, thinly pubescent in all parts except the corolla with minute adpressed hairs. *Leaves* large, pinnately trifoliolate; petiole ¼–½ in. long; lateral leaflets 2½–3¾ in. long, 1–1⅛ in. broad, obliquely lanceolate, acute, shortly petiolulate, stipellate; middle leaflet 3½–5 in. long, 2–2¼ in. broad, rhomboid-lanceolate, acute, rounded at the base, shortly petiolulate, stipellate, separated from the lateral leaflets by a rachis 1–1½ in. long; stipules 2½–3 lin. long, falcate, acute, reflexed. *Racemes*, including the 2–2½ in. long peduncle, 4–7 in. long, lax. *Flowers* 2–3 together at the nodes of the raceme. *Bracts* 1½–2 lin. long, oblong, acute, caducous. *Pedicels* 1½ lin. long. *Calyx* about 3 lin. long, lobed to the middle; the 2 upper lobes connate for half their length, and together with the lateral lobes oblong, obtuse; the lowest lobe slightly longer than the rest, acute. *Corolla* 5 lin. long, glabrous, purple; keel obtuse. *Legume* not seen.

Kwebe, *Lugard*, 61.

A well-marked species, the rhomboid-lanceolate middle leaflet easily distinguishes it from all the others. In the bifid upper lip of

the calyx it differs somewhat in generic character, but there is no genus with which it can be so well associated, and in the absence of fruit I abstain from proposing a genus upon so slender a point of difference.

Vigna triloba, *Walp.*
Kwebe Hills, 3,400 ft., *Lugard*, 185 ; *Mrs. Lugard*, 170.
A trailing annual ; leaves sometimes variegated ; flowers mauve or purple.

Vigna Burchellii, *Harv.*
Kwebe, *Lugard*, 63 ; Botletle Valley, *Lugard*, 240 ; Kalahari Desert and between Lake Ngami and the River Zuga, *McCabe*, 12.
Grows freely, with long trailers, but does not climb ; flowers purple and pink.

Dolichos gibbosus, *Thunb.*
Bechuanaland ; near Palapye, 3,000 ft., *Lugard*, 239.

Rhynchosia caribaea, *DC.*
Kwebe Hills, *Lugard*, 173 ; *Mrs. Lugard*, 207.
Creeping on the ground ; flowers orange-yellow, with chocolate stripes.

Lonchocarpus sp. ?
Near Lake Ngami, *Lugard*, 21.
Tree 20 ft. high, flowering before the leaves appear.
The specimen is leafless and without fruit, so that it cannot be properly determined.

Peltophorum africanum, *Sond.*
Northern Kalahari Desert, 3,000 ft., *Lugard*, 241.
A bushy tree 20 ft. high ; flowers yellow.

Hoffmanseggia rubra, *Engl.*
Kalahari Desert ; at the T'Klakane Pits, 2,500 ft., *Lugard*, 305.
A thorny bush, growing to 5 ft. high ; flowers pink.
The specimens are much more spiny, and have shorter racemes than in the typical form, but are otherwise identical.

Cassia obovata, *Collad.*
Kalahari Desert ; near T'Klakane Pits, *Lugard*, 229 ; Kwebe Hills, 3,000 ft., *Mrs. Lugard*, 201.
Creeping on the ground ; flowers yellow.

Cassia Absus, *Linn.*
Kwebe Hills, 3,300 ft., *Lugard*, 137 ; *Mrs. Lugard*, 193.
Annual, growing to 15 in. high ; flowers orange or buff.

Bauhinia esculenta, *Burch.*
Kalahari Desert ; Kwebe to Palapye, 3,000 ft., *Lugard*, 242.
A ground-creeper ; flowers yellow.

Bauhinia macrantha, *Oliv.*
Kwebe Hills, 3,300 ft., *Lugard*, 144 ; *Mrs. Lugard*, 189.
A bush 4–15 ft. high, flowers white, pod green.

Copaifera Mopane, *Kirk.*
Ngamiland and Northern Kalahari Desert, 3,000 ft., *Lugard*, 243 ; near T'Klakane Pits, 3,000 ft., *Lugard*, 296.

A tree growing to 25 ft. high; flowers white; fruit green. It is called "Mopani" by the natives.

Copaifera coleosperma, *Benth.*

Okavango Valley, about 3,000 ft., *Lugard*, 244.

A fine spreading tree, growing to 40 ft. high; pod green, containing one scarlet seed. Found away from the river in dry sandy country. The natives boil the seeds, from which they get a soup.

Dichrostachys arborea, *N. E. Br.* *Arbor* 6 m. alta, spinosa. *Folia* 1·8–5·6 cm. longa; pinnae 10–15-jugae, 6–14 mm. longae; foliolae 12–28-jugae, minutae, 0·7–1·5 mm. longae. *Pedunculi* 1·5–2·5 mm. longi. *Filamenta* florum inferiorum ad 10 mm. longa.

A *tree* growing to 20 ft. high. *Branchlets* and spines horizontally spreading, at first puberulous, becoming glabrous, grey. *Leaves* bipinnate, $\frac{3}{4}$–$2\frac{1}{4}$ in. long, apparently less than $1\frac{1}{4}$ in. broad when fully expanded, pubescent except on the upper surface of the leaflets; pinnae in 10–15 pairs, 3–7 lin. long, with a stalked gland between the basal pair; leaflets in 12–28 pairs, minute, $\frac{1}{3}$–$\frac{3}{4}$ lin. long, oblong-linear, obtuse. *Spikes* $1\frac{1}{2}$–2 in. long, cylindric, obtuse, with pubescent peduncles $\frac{3}{4}$–$1\frac{1}{4}$ in. long. *Lower* or *sterile flowers* purple; calyx $\frac{1}{3}$ lin. long, cupular, minutely 5-toothed, pubescent; corolla glabrous, with a tube $\frac{1}{2}$ lin. long and five ovate acute lobes $\frac{1}{3}$ lin. long, $\frac{1}{4}$ lin. broad; staminal filaments 4–5 lin. long. *Upper* or *fertile flowers* yellow; calyx $\frac{2}{5}$ lin. long, campanulate, 5-toothed, pubescent; corolla glabrous, with a tube $\frac{2}{3}$–$\frac{3}{4}$ lin. long and five oblong acute lobes $\frac{1}{3}$–$\frac{1}{2}$ lin. long, $\frac{1}{5}$ lin. broad; ovary densely pubescent. *Legume* not seen.

Totin, near Lake Ngami, *Lugard*, 27.

Dichrostachys Lugardae, *N. E. Br.* *Frutex* ad 3 m. altus, spinosus. *Folia* 5–8·7 cm. longa; pinnae 6–11-jugae, 1·6–3 cm. longae; foliola 20–36-juga, 2·5–3·5 mm. longa. *Pedunculi* 3·7–5·6 cm. longi. *Filamenta* florum inferiorum ad 1·4 cm. longa.

A thorny *bush* 8–10 ft. high, with a glabrous greyish-brown bark. *Leaves* bipinnate, pubescent except on the upper surface of the leaflets, 2–$3\frac{1}{2}$ in. long, $1\frac{3}{4}$–$2\frac{1}{4}$ in. broad when fully expanded; pinnae in 6–11 pairs, 8–15 lin. long, spreading, with a long-stalked gland between the basal pair; leaflets in 20–36 pairs, $1\frac{1}{4}$–$1\frac{3}{4}$ lin. long, linear, subfalcate, acute. *Spikes* 1–2 in. long, cylindric, obtuse, with pubescent peduncles $1\frac{1}{2}$–$2\frac{1}{4}$ in. long. *Lower* or *sterile flowers* purple; calyx $\frac{1}{4}$ lin. long, cupular, minutely 5-toothed, pubescent; corolla glabrous, with a tube $\frac{1}{3}$–$\frac{1}{2}$ lin. long and five oblong-ovate acute lobes $\frac{1}{2}$–$\frac{2}{3}$ lin. long, $\frac{1}{3}$–$\frac{2}{5}$ lin. broad; staminal filaments 6–7 lin. long. *Upper* or *fertile flowers* yellow; calyx $\frac{1}{3}$ lin. long, campanulate, 5-toothed, pubescent; corolla glabrous, with a tube $\frac{2}{3}$–$\frac{3}{4}$ lin. long and five ovate-oblong acute lobes $\frac{1}{2}$ lin. long, $\frac{1}{4}$ lin. broad; ovary densely pubescent. *Legume* (according to a drawing by Mrs. Lugard) flat, curled, about $3\frac{1}{2}$ in. long and $\frac{1}{4}$ in. broad, brown.

Kwebe Hills and Kalahari, 3,000–3,500 ft., *Lugard*, 42; *Mrs. Lugard*, 78.

Acacia arabica, *Willd.*

Totin, near Lake Ngami, *Lugard*, 28; Kwebe Hills, 3,300 ft. *Mrs. Lugard*, 30.

A tree growing to 15 ft. in height; flowers golden yellow.

Acacia hebeclada, *DC.?*

Lake River, *Lugard*, 20.

Grows to 12 ft. high as a bush. The specimen is without fruit, and the identification is, therefore, uncertain.

Acacia litakunensis, *Burch.*

Kwebe Hills, 3,200–3,600 ft., *Mrs. Lugard*, 49.

A bush or tree growing to 15 ft. in height; flowers creamy, very sweetly scented.

Acacia ferox, *Benth.*

Kalahari Desert, 3,000 ft., *Mrs. Lugard*, 13.

A bush growing to 20 ft. in height, flowering before the leaves appear; flowers white, strongly scented; pod chocolate. Known locally as "Hack-thorn."

Acacia rufobrunnea, *N. E. Br.* *Rami*, spini, petioli et rhachides rufo-brunnei. *Stipulae* spinescentes, rectae. *Folia* bipinnata; pinnae 18–24-jugatae; foliola 20–24-juga, 2·5 mm. longa, linearia, obtusa, glabra; rhachides pubescentes. *Flores* capitati, albi. *Pedunculi* fasciculati, supra medium involucrati, pubescentes.

Young *branches* reddish-brown, thinly pubescent. *Stipulary spines* equal, straight, 1–1¼ in. long, reddish-brown, pubescent when young. *Leaves* 4–5 in. long, abruptly bipinnate; pinnae in 18–24 pairs, 7–11 lin. long; leaflets in 20–24 pairs, 1¼ lin. long, rather less than ½ lin. broad, linear, obtuse, glabrous, with a central depressed midrib on the under side; petiole with a sessile gland near its base, and together with the rachides reddish-brown and pubescent along the upper side. *Flowers* capitate, white. *Peduncles* axillary, fascicled, 6–8 lin. long, with an involucel 1–2 lin. below the apex, pubescent below the involucel, somewhat tomentose above it. *Calyx* less than half the length of the corolla, ½ lin. long, infundibuliform, shortly crenate-dentate, puberulous in the upper part. *Corolla* 1⅓ lin. long, tubular, 5–6-toothed to one quarter of the way down, glabrous; teeth ovate, subobtuse. *Stamens* lin. long. *Legume* not seen.

Botletle Valley, *Lugard*, 245.

Allied to *A. verugera*, Schweinf., but easily distinguished by its reddish brown bark, spines, and leaf-rachides.

Acacia caffra, *Willd.*

Kwebe, *Lugard*, 93; Tamalakane River, near Lake Ngami, *McCabe*, 29.

A bush, seldom above 8 ft. high; bark of the branches white; flowers white (*Lugard*). Grows about 20 ft. high, with short thick thorns on the stem; flowers whitish or pale yellow, looking quite white at a distance (*McCabe*).

Acacia Lugardae, *N. E. Br.* *Arbor* ad 4·75 m. alta. *Rami* spinis parvis recurvis armati, puberuli, brunnei, demum glabri et cinerei; spinae stipulares nullae. *Folia* bipinnata; pinnae 12–14-jugae; foliola 20–32-juga, 3–3·5 mm. longa, lineari-oblonga, subobtusa, basi subtruncata, minute ciliolata; petioli spinis parvis recurvis armati, dense puberuli. *Spicae* fasciculatae, in paniculam terminalem dispositae. *Pedunculi* minute tomentosi. *Flores* glabri, luteo-albi. *Legumen* rectum, planum, lineari-oblongum, utrinque acutum, stipitatum, seminibus 3–4.

A *tree*, up to 15 ft. high. *Branches* greyish, at first minutely subtomentose, becoming glabrous, armed with scattered hooked prickles $\frac{3}{4}$–$1\frac{1}{2}$ lin. long, no stipular prickles. *Leaves* bipinnate, 2–$3\frac{1}{2}$ in. long, puberulous on the primary and secondary rachides and armed with small hooked prickles along the underside of the primary rachis; pinnae in 12–14 pairs, $\frac{3}{4}$–$1\frac{1}{4}$ in. long, with a sessile gland between the lowest and between the 1–2 uppermost pairs; leaflets in 20–32 pairs, $1\frac{1}{2}$–$1\frac{3}{4}$ lin. long, $\frac{1}{3}$ lin. broad, straight, linear-oblong, subobtuse, unequal-sided, nearly truncate at the base, minutely ciliolate, otherwise glabrous. *Racemes* several or numerous in a terminal leafless inflorescence or sometimes axillary from the leaves, 1–3 at each node, $1\frac{3}{4}$–$2\frac{1}{4}$ in. long (including the $\frac{1}{4}$–$\frac{1}{2}$ in. long minutely tomentose peduncle), densely many-flowered. *Flowers* creamy-white. *Calyx* not half as long as the corolla, $\frac{1}{2}$ lin. long, campanulate, with short broadly deltoid teeth, glabrous. *Corolla* tubular-campanulate, glabrous; tube $\frac{3}{4}$–$\frac{7}{8}$ lin. long, lobes $\frac{2}{5}$–$\frac{1}{2}$ lin. long, ovate or oblong-ovate, acute. *Stamens* very numerous, about twice as long as the corolla. *Disk* cup-shaped. *Ovary* ellipsoid, densely villose-tomentose, 4-ovuled, seated on a glabrous stipe $\frac{2}{3}$ lin. long; style $1\frac{2}{3}$ lin. long, glabrous. *Pod* $1\frac{1}{2}$–$1\frac{3}{4}$ in. long, $\frac{1}{3}$–$\frac{1}{2}$ in. broad, linear-oblong, flat, thin, acute at each end, 3–4-seeded, reddish-brown, glabrous or nearly so, with only here and there a trace of the hairs which densely clothe the ovary, tapering at the base into a stalk 4–5 lin. long.

Kwebe Hills, 3,300 ft., *Mrs. Lugard*, 195.

This species is very similar to *A. caffra*, Willd., but is easily distinguished by the prickles on the leaves, the very much smaller calyx (which is open from a very early stage, not closed over the corolla as in *A. caffra*), and by the very hairy ovary and the shorter, fewer-seeded pods.

Acacia glandulifera, *Schinz.*

Kwebe Hills, 3,000 ft., *Mrs. Lugard*, 14, 16.

A bush, up to 6 feet high. This very distinct species is easily recognised by the absence of an involucel on the peduncles and the sessile glands scattered on the petioles of the leaves and densely covering the flat falcate pods.

Acacia kwebensis, *N. E. Br.* *Arbor* 6 m. alta. *Stipulae* spinescentes, parvae, uncinatae, brunneae. *Folia* hysterantha, bipinnata; pinnae 3–5-jugae; foliola 8–13 juga, oblique lineari-oblonga, subacuta, glabra, pallida; petiolus et rhachis pubescentes. *Flores* spicati, albi. *Pedunculi* et *calyces* tomentosi. *Legumen* rectum, lineari-oblongum, acutum.

A *tree*, attaining a height of 20 ft., flowering before the leaves appear, with a pearly-white bark. *Branchlets* with a short spreading pubescence when young; bark pale grey. *Stipulary spines* equal, 2–3 lin. long, recurved, brown. *Leaves* abruptly bipinnate; pinnae in 3–5 pairs; leaflets in 8–13 pairs, $2\frac{1}{4}$–3 lin. long, $\frac{3}{4}$ lin. broad, obliquely linear-oblong, subacute, glabrous, pale glaucous-green; petiole and rachis with a fine spreading pubescence. *Flowers* spicate, white. *Spikes* somewhat clustered at the nodes, the short primary peduncle umbellately dividing into 2–3 secondary peduncles about $\frac{1}{2}$ in. long, tomentose; the flowering part 1–2 in. long, 6–7 lin.

diam., dense. *Calyx* about half as long as the corolla, 1¼ lin. long, campanulate, acutely 5-toothed to about one-third the way down, tomentose. *Corolla* 2 lin. long, tubular, with five spreading teeth, minutely and thinly adpressed-pubescent outside; teeth ½ lin. long, ovate, acute. *Stamens* 3½ lin. long. *Legume* shortly stipitate, 3–3½ in. long, 6–7 lin. broad, flat, acute at both ends, tapering at the base into a stipe ¼ in. long.

Kwebe Hills, 3,000–3,400 ft., flowering in September, *Mrs. Lugard*, 24.

This species is very similar to *A. erubescens*, Welw., and should stand next to that species, from which it differs in having white flowers, with the corolla and stamens about twice as long as in that species. I have not seen the pod, but describe it from Mrs. Lugard's excellent drawing.

Albizzia Harveyi, *Fourn.* in Bull. Soc. Bot. Fr. xii., 399 (1865).

Legume 3¾–4¼ in. long, 1 in. broad, flat, thin, of parchment-like consistence, acute at both ends, very shortly stipitate, broadly sinuate-crenate along both margins, with the notches opposite the insertion of the funicles, bullate over the seeds, glabrous, green, suffused with purple. *Funicle* with a double curve just below its attachment to the hilum. *A. pallida*, Harv. in Fl. Cap. ii., 284, not of Fourn. *A. hypoleuca*, Oliver, Fl. Trop. Afr. ii., 356.

Kwebe Hills, 3,300 ft., *Mrs. Lugard*, 32.

The fruit of this plant has not been described previously. According to McCabe it is a tree of about 10 ft. in height, but according to Mrs. Lugard it grows to 20 ft. and is "the only thornless Acacia found in the country." The flowers are creamy-white.

Albizzia Lugardi, *N. E. Br.* *Arbor* ad 12 m. alta. *Folia* bipinnata; pinnae 2–3-jugae, 2–4-foliolatae; foliola magna, oblique obovata, obtusa. *Flores* ignoti. *Legumen* lineari-ligulatum, utrinque acutum, coriaceum, planum.

A *tree*, growing to 40 ft. high, with very hard wood. *Branches* greyish-brown, armed with recurved prickles swollen at the base, the swelling increasing in size with age. *Leaves* bipinnate, thinly puberulous in all parts; pinnae in 2–3 pairs, the terminal pair usually largest, each with one or two pairs of obliquely obovate leaflets, very obtusely rounded or slightly notched at the apex, ½–1 in. long, ⅓–⅔ in. broad. *Pods* 5½ in. long, ⅔–¾ in. broad, linear-ligulate, acute at both ends, rigidly coriaceous, thin and flat, straight, with even margins, glabrous, brown, 5–6-seeded. *Seeds* flat, orbicular.

Okavango Valley, about 3,000 ft., locally known as the "Knobby thorn," *Lugard*, 246.

I refer this to *Albizzia* with some hesitation, as the specimen is flowerless, but in its general characteristics it agrees with that genus, and in foliage somewhat resembles *A. anthelmintica*, A. Brongn.

Albizzia anthelmintica, *A. Brongn.*

Near Kwebe Hills, 3,200 ft., *Mrs. Lugard*, 15.

A large bush, 20 ft. high, growing at the foot of hills, not found upon them; flowers creamy-white; pods bright green.

Saxifragaceae.

Vahlia capensis, *Thunb.*
Kwebe Hills, 3,300 ft., around swampy places, *Mrs. Lugard*, 145.
Plant growing to 6 in. high, with golden flowers.

Crassulaceae.

Crassula elata, *N. E. Br.* *Herba* elata, pubescens. *Folia* opposita, superioria oblonga, subacuta, ciliata. *Verticillastri* densi, multiflori, in spicam interruptam elongatam dispositi. *Sepala* oblongo-lanceolata, acuta. *Petala* lineari-oblonga, dorso ad apicem apiculata, glabra, rubescentia.

An erect *herb* about 2 ft. high, everywhere, with the exception of the corolla and inner parts of the flowers, clothed with a short white pubescence. Lower part of the stem not seen, upper part ending in a narrow, interrupted, spike-like inflorescence a foot long. *Upper stem-leaves* about $1\frac{1}{2}$ in. long, 5–6 lin. broad, oblong or lanceolate-oblong, sub-acute, gradually passing into small ovate bracts, ciliate. *Flowers* in small dense sessile cymules or verticillasters about $\frac{3}{4}$-in. diam. along the terminal part of the stem, very numerous and about $\frac{1}{2}$-in. apart. *Bracteoles* $1\frac{1}{2}$–$2\frac{1}{2}$ lin. long, linear-lanceolate or subulate. *Pedicels* $1\frac{1}{2}$ lin. long. *Sepals* $1\frac{1}{2}$ lin. long, oblong-lanceolate, acute, ciliate. *Petals* slightly exceeding the sepals, $1\frac{2}{3}$ lin. long, narrowly oblong, obtuse, with a dorsal apiculus at the apex, glabrous. *Stamens* not exserted, glabrous. *Hypogynous scales* quadrate, bifid. *Carpels* oblong, obtuse, glabrous; stigma quite sessile, slightly oblique.

Bechuanaland; near Palapye, 3,000 ft., *Lugard*, 247.

This species is allied to *C. tomentosa*, Thunb., differing in its more numerous, more crowded whorls of flowers and short petals, which, according to Lugard, are brown, but in the dried specimen appear to have been dull reddish.

Kalanchoe multiflora, *Schinz.*
Kwebe Hills, *Mrs. Lugard*, 224.
Corolla green, edged with yellowish-red on the lobes.

Kalanchoe glandulosa, *Hochst.* var.?
Kwebe Hills, *Mrs. Lugard*, 227.
Flowers brick-red.

Combretaceae.

Terminalia sericea, *Burch.*
Kalahari Desert; at T'Klakane Pits, 2,500 ft? *Lugard*, 306.
The common scrub-bush of the desert, everywhere where no water is. Usually a bush up to 6 ft., but sometimes grows to a tree 20 ft. high; flowers greenish-white.

Terminalia prunioides, *Laws.*
Kwebe Hills, 3,000–3,500 ft., *Lugard*, 41; *Mrs. Lugard*, 101.
A tree, 20–30 ft. high, $2\frac{1}{2}$ ft. in girth, with very hard and tough wood, useful as timber; flowers white; fruit dark red.

Combretum truncatum, *Welw.*
Totin, near Lake Ngami, *Lugard*, 29; Kwebe Hills, 3,300 ft., *Mrs. Lugard*, 72.

A tree, 25–30 ft. high, 15–18 inches in diameter ; flowers green, sweetly scented.

Combretum Eilcherianum, *Schinz ?* (*C. Eilkeri*, Engler & Diels. Monog. Afr. Pflanz.-Fam. Combret. 61.)

Botletle River, *Lugard*, 9.

A tree, growing to 20 ft. high ; flowers whitish-green ; fruit flat, brown.

Combretum kwebense, *N. E. Br.* *Frutex* ramulis cinereo-tomentosis. *Folia* opposita, breviter petiolata, elliptica vel subobovata, acuta, subcuspidata vel obtusa, basi emarginata vel leviter cordata, primum utrinque pubescentia, demum glabrescentia, infra minute glandulosa. *Spicae* axillares, pedunculatae, breviter oblongae. *Calycis tubus* pubescens et glandulosus, 4-dentatus. *Petala* minuta, late cuneato-obovata et truncata vel rotundata, ciliata. *Stamina* exserta.

A *bush* 10 ft. high, tomentose on the young shoots, becoming glabrous, with a brown bark. *Leaves* opposite, contemporary with the flowers ; petiole 1–2 lin. long ; blade $1\frac{1}{4}$–2 in. long, 10–15 lin. broad, elliptic or slightly obovate, acute, shortly cuspidate, or occasionally obtuse, emarginate or slightly cordate at the obtusely rounded base, at first thinly tomentose-pubescent on both sides, and minutely glandular beneath, becoming nearly glabrous above, with very minute whitish papillae in the dried state. *Spikes* axillary, simple. *Peduncle* 4–9 lin. long. *Flowers* sessile, yellowish-green, sweet-scented, crowded into an oblong spike $\frac{1}{2}$–$\frac{3}{4}$ in. long and about $\frac{1}{2}$-in. diam. *Bracts* minute, subulate. *Calyx-tube* pubescent and glandular, the part above the ovary broadly cup-shaped, thinly pubescent within, 4-toothed ; teeth deltoid, acute ; disk about $\frac{1}{3}$ as long as the cup, with a free hairy margin. *Petals* minute, $\frac{1}{3}$–$\frac{1}{2}$ lin. long and broad, broadly cuneate-obovate and truncate, or somewhat circular, ciliate. *Stamens* exserted, 2 lin. long ; anthers very obtuse. *Fruit* not seen.

Kwebe, *Lugard*, 48.

Allied to *C. fulvotomentosum*, Engl. & Diels.

Combretum cataractarum, *Diels.*

Lake River, *Lugard*, 15 ; Kwebe Hills, 3,200 ft., *Lugard*, 15A ; *Mrs. Lugard*, 10.

A tree-creeper, up to 20 ft. high ; flowers white, appearing in August and September, about a month before the leaves ; fruit russet-green or pink.

Combretum apiculatum, *Sond.*

Kwebe Hills, 3,300 ft., *Mrs. Lugard*, 25.

A tree, 15 feet high. A very early flowerer, the same tree profusely in flower and full leaf together in December ; flowers green.

Lythraceae.

Nesaea rigidula, *Koehne.*

Botletle Valley, *Lugard*, 248.

Onagrarieae.

Jussiaea repens, *Linn.*

In water at the junction of the Tamalakane and Botletle Rivers. *Lugard*, 3.

Flowers primrose-yellow.

Turneraceae.

Wormskioldia serrata, *Hochst.*
Kwebe Hills, 3,300 ft., *Lugard*, 116 ; *Mrs. Lugard*, 105.
An annual, growing to 9 in. high ; flowers orange.

Wormskioldia longepedunculata, *Mast.*
Northern Kalahari Desert ; near Inkonane Pits, about 3,000 ft., *Lugard*, 292.
The plant grows to 6 in. high ; flowers scarlet.

Cucurbitaceae.

Trochomeria debilis, *Hook. f.*, **var.**
Kwebe Hills, 3,300 ft., *Lugard*, 43, 168 ; *Mrs. Lugard*, 39.
Flowers green.

Lagenaria vulgaris, *Ser.*
In cultivation by Lake River, *Lugard*, 191.
Flowers pure white.

Cucumis Figarei, *Del.* **var. echinophorus,** *Naud.*
Kwebe Hills, 3,300 ft., *Lugard*, 169 ; *Mrs. Lugard*, 156.
A common Kalahari ground-melon ; flowers yellow ; fruit yellowish-green.

Citrullus vulgaris, *Schrad.*
Kwebe Hills, 3,300 ft., *Mrs. Lugard*, 154.
This is the common Kalahari melon. It is eaten by Bushmen, affording often the sole water supply to them and also to antelopes ; flowers yellow ; fruit mottled with yellow and green.

Citrullus Naudinianus, *Hook. f.*
Kwebe Hills, 3,300 ft., *Mrs. Lugard*, 155.
One of the Kalahari melons ; flowers yellow ; fruit straw-coloured.

Coccinea sp.? Specimen with female flowers only.
Kwebe, *Lugard*, 64.

Coccinea sp.? Specimen in fruit only.
Kwebe, *Lugard*, 120.

Coccinea sp.? Specimen with female flowers and fruit, no male flowers.
Kwebe Hills, 3,300 ft., *Mrs. Lugard*, 149.
A climber ; flowers pale ochre, with darker vein ; fruit at first green variegated with whitish, becoming magenta when ripe.

Toxanthera Lugardae, *N. E. Br.* *Herba* scandens, monoica, subscabrido-pubescens. *Folia* peliolata, late 3–5-loba, basi latissime cordata ; lobi oblongi vel rotundati, acute denticulati, acuti vel obtusi. *Cirrhi* simplices. *Flores* masculi corymboso-racemosi ; calycis tubus campanulatus ; lobi attenuato lanceolati, integri vel utrinque 1–2-dentati, 4 mm. longi ; petala libera, oblonga, obtusa, 2 lin. longa ; staminum filamenta libera ; antheræ valde curvatæ. *Flores feminei* solitarii ; calyx et corolla maris ; ovarium anguste fusiforme. pubescens ; stigma reflexum, copriniforme, integrum. *Fructus* 7·5–8·7 cm. longus, fusiformis vel cylindricus, rostratus.
A climbing *herb*, monoecious. *Stem* rather slender, minutely pubescent. *Leaves* petiolate ; petiole ¾–1 in. long ; blade 1¾–3 in.

Stem terete, glabrous, branching. *Leaves* 2–4 in. long, ½–1¾ in. broad, lanceolate elliptic or oblong-lanceolate, acute, acutely tapering into a short petiole at the base, glabrous and green on both sides; axils often furnished with a pair or a tuft of four slender bristle-like spines 1½–2 lin. long. *Flower-spikes* 1¼–2½ in. long, about ¾ in. in diam.; excluding the lower corollas, dense, many-flowered. *Bracts* imbricate, 5–7 lin. long, 2–5 lin. broad near the apex, spathulate-obovate or cuneate-obovate, very obtuse or slightly emarginate at the slightly recurved, very shortly mucronulate apex, slightly complicate, rather rigid, prominently 3–5-nerved on the back, white-pruinose on both sides, glandular on the back, adpressed-pubescent on the nerves and ciliate on the margins, with moderately long hairs, thinly and minutely puberulous on the inner face. *Bracteoles* ½ in. long, ¾ lin. broad, linear, pungent-acute, keeled and adpressed-pubescent on the back, ciliate. *Sepals* four, about 5 lin. long, the outer 2 lin., the inner 1 lin. broad at the base, lanceolate, attenuate to a very acute, almost pungent point, glandular on the back in the upper part, otherwise glabrous. *Corolla* orange-yellow, puberulous outside and about the insertion of the stamens within the tube, subbilabiate, the limb being divided so that one lobe is free from the tube about ¼ in. below the other four; tube ½ in. long, narrow cylindric; lobes 5 lin. long, 3–3½ lin. broad, elliptic-oblong, obtuse. *Stamens* two, inserted above the middle of the corolla-tube, 6–7 lin. long, exserted; filaments filiform, slightly puberulous; anthers obtusely sagittate, 1⅓ lin. long; cells equal. *Ovary* and the filiform style glabrous; stigma obscurely conical, with a very slightly marked ring around its base.

Kwebe, 3,300 ft., *Mrs. Lugard*, 5A.

Another specimen, No. 5, collected by Mrs. Lugard by the Botletle River, at Moremi's Drift, is considered by her to belong to the same species. If this is the case, it was probably gathered from a starved plant, as most of the leaves have fallen and the flower-spikes are reduced to 1–4 flowers, which although similar in form and colour are smaller than in the plant I have described; the bracts also are mostly acute and not whitened beneath. The material, however, is too unsatisfactory for exact determination.

B. spathulata is allied to *B. Prionitis*, Linn., but very distinct in appearance, being readily recognised by its very obtuse, cuneate-obovate, pruinose bracts, smaller corolla, and by the stamens being inserted towards the top of the corolla-tube and not at the middle as they are in *B. Prionitis*, Linn.

***Barleria Lugardii**, *C. B. Clarke* in Fl. Trop. Afr. v., p. 161.
Kwebe Hills, 3,300 ft., *Lugard*, 128; *Mrs. Lugard*, 106.
Perennial, 1–1½ ft. high; flowers white.

Crabbea velutina, *S. Moore*.
Kwebe Hills, 3,300 ft., *Lugard*, 131; *Mrs. Lugard*, 96.
Perennial, growing under rocks and trees, in shade; flowers white.

Justicia leptocarpa, *Lindau*.
Kwebe Hills, 3,200 ft., *Lugard*, 129; *Mrs. Lugard*, 138.
Annual, growing to a foot in height; flowers pale mauve, spotted with darker mauve.

Justicia odora, *Vahl.*

Near Kwebe, *Lugard*, 72 ; Kwebe Hills, 3000 ft., *Mrs. Lugard*, 160.

Perennial, growing to 2 ft. high ; flowers yellow.

Monechma Nepeta, *C. B. Clarke.*

Kwebe Hills, 3,300 ft., *Lugard*, 172 ; *Mrs. Lugard*, 131.

Perennial, growing to 2 ft. high ; flowers pale mauve or purplish-white.

Monechma bracteatum, *Hochst.*

Kwebe Hills, 3,300 ft., *Mrs. Lugard*, 192.

Annual, growing to 15 in. high ; flowers purple, with a white throat to the tube.

Ecbolium Lugardae, *N. E. Br.* *Fruticulus* ramosus usque ad 45 cm. altus. *Rami* pilis crispulis minutis recurvo-patentibus puberuli. *Folia* valde patula vel deflexa, herbacea, supra saturate viridia, petiolo 2–5 mm. longo ; lamina 3·5–6 cm. longa, 8–22 mm. lata, lanceolata, longe acuminata, utrinque parcissime puberula vel fere glabra. *Bracteae* dense imbricatae, 12–18 mm. longae, 7–13 mm. latae, ovatae vel ellipticae, acutae, spinulo 1·5–2 mm. longo hamato-mucronatae, ciliatae. *Calyx* 5-lobus ; tubus 2–2·5 mm. longus ; lobi 4–6 mm. longi, anguste lanceolati, setuloso-attenuati, pilis simplicibus ciliati. *Corolla* bilabiata, coerulea ; labium superius oblongo-lanceolatum, obtusum, minutissime bifidum ; labium inferius profunde 3 lobum, lobis oblongo-lanceolatis obtusis.

A much branched *shrublet*, about 18 in. high. *Branches* puberulous with spreading recurved or somewhat curly hairs. *Leaves* very spreading or deflexed, thin, herbaceous, nearly glabrous or with a minute very scattered inconspicuous pubescence on both sides ; petiole 1–2½ lin. long ; blade 1⅓–2⅕ in. long, 4–11 lin. broad, lanceolate, long-acuminate, acute, rounded to acutely cuneate at the base, dark green above, pale green beneath. *Spikes* 1–2¼ in. long, densely 8–20-flowered. *Bracts* imbricate, 6–9 lin. long, 3½–6½ lin. broad, ovate or elliptic, rather abruptly and acutely narrowed into a pungent recurved hooked spine-like tip ¾–1 lin. long, with reflexed margins at the base, slightly rough to the touch, ciliate. *Bracteoles* 1½–2 lin. long, subulate, subspinous. *Calyx* 5-lobed ; tube 1–1¼ lin. long, lobes 2–3 lin. long, narrowly lanceolate, attenuate to a fine almost bristle-like point, ciliate with simple hairs and with a few gland-tipped hairs down the back. *Corolla* 2-lipped, light blue ; tube about 5½ lin. long ; upper lip of one oblong-lanceolate lobe about 13 mm. long and 1½–1¾ lin. broad, very minutely notched at the obtuse apex ; lower lip of 3 lobes 5½–6 lin. long, 1¾ lin. broad, oblong-lanceolate, obtuse. *Stamens* 2, exserted ; anthers oblong, equally 2-celled, obtuse at the base, yellow. *Disk* cupular, truncate. *Ovary* ovoid, glabrous ; cells 2-ovulate ; style filiform, glabrous ; stigma minutely 2-lobed.

Kwebe Hills, 3,300 ft., *Mrs. Lugard*, 212.

Mrs. Lugard notes that the flowers of this plant close at noon.

Ecbolium cognatum, *N. E. Br.* Valde affinis *E. Lugardae*, N. E. Br. *Rami* minute adpresse incano-pubescentes. *Folia* adscendentia, subcoriacea, siccata flavo-viridia, petiolo 1–3 mm. longo ; lamina 2–4 cm. longa, 5–11 mm. lata, lanceolata vel anguste lanceolata,

apice acuta vel obtusa, basi cuneata, utrinque parcissime et minute pubescens vel fere glabra. *Bracteae* 15–20 mm. longae, 5–10 mm. latae, ovatae, apice in spinulam recurvo-hamatam 3 mm. longam attenuatae, ciliatae. *Calycis tubus* 1·5–2 mm. longus; lobi 5–6·5 mm. longi, lanceolato-attenuati, pilis glanduliferis pubescentes et ciliati. *Flores* iis *E. Lugardae* similes.

A small compactly branched *shrublet*, up to 1 ft. high, closely allied to *E. Lugardae*, N. E. Br., with the branches more ascending and more leafy and their pubescence more minute, denser and closely adpressed. *Leaves* ascending, subcoriaceous, concolorous, yellowish-green; petiole $\frac{1}{2}$–$1\frac{1}{2}$ lin. long; blade $\frac{3}{4}$–$1\frac{2}{3}$ in. long, $2\frac{1}{2}$–$5\frac{1}{2}$ lin. broad, lanceolate or sometimes almost linear-lanceolate, acute or obtuse, cuneate at the base, nearly glabrous or very thinly sprinkled with minute hairs above and puberulous on the veins beneath. *Spikes* and *flowers* almost as in *E. Lugardae*, but the bracts longer, narrower and more acuminate, $\frac{2}{3}$–$\frac{3}{4}$ in. long, $2\frac{1}{2}$–5 lin. broad, ovate, gradually tapering into a pungent recurved hooked spine-like tip $1\frac{1}{2}$ lin. long. *Calyx-tube* $\frac{3}{4}$–1 lin. long; lobes $2\frac{1}{2}$–$3\frac{1}{4}$ lin. long, lanceolate-attenuate to a fine point, but scarcely bristle-like, ciliate and pubescent on the back with gland-tipped hairs. *Corolla* bright sky-blue.

Northern Kalahari Desert; near Chukutsa Salt-pan, *Lugard*, 223.

In the Flora of Tropical Africa v., p. 239, this plant is quoted under *E. hamatum*, Clarke, which was founded upon *Blechum hamatum*, Klotzsch, but according to Klotzsch's original description widely differs from *E. cognatum*, in having membranous leaves, dark green above and paler beneath and obovate bracts, besides being a native of a widely different region. *E. hamatum*, *E. cognatum* and *E. Lugardae* are doubtless all closely allied, but seem distinguishable by the following characters. *E. cognatum* differs from both the others by its subcoriaceous, yellowish-green and smaller leaves. *E. hamatum* and *E. Lugardae* have thin herbaceous or submembranous leaves, dark green above, paler beneath, but *E. hamatum* (according to Klotzsch's description) has leaves $1\frac{1}{3}$ in. long and 6 lin. broad, and merely acute, with conduplicate obovate-bracts; whilst in *E. Lugardae* they are $1\frac{1}{3}$–$2\frac{1}{3}$ in. long, 4–11 lin. broad, and long-acuminate, with flattish ovate bracts.

Verbenaceae.

Lippia nodiflora, *Rich.*

Near Kwebe, *Lugard*, 83; Botletle Valley, *Lugard*, 199.

Flowers purplish-white.

Lantana salvifolia, *Jacq.*

Kwebe Hills, 3,400 ft., *Lugard*, 176; *Mrs. Lugard*, 68.

A perennial, growing to 2 ft. high; flowers, some white some mauve on the same head.

Bouchea pinnatifida, *Schauer.*

Kwebe Hills, 3,000 ft., *Mrs. Lugard*, 166.

An annual, growing to 10 in. high.

Clerodendron spinescens, *Gürke.*

Okavango Valley, about 3,000 ft., *Lugard*, 234.

A thorny bush; flowers scarlet.

Clerodendron lanceolatum, *Gürke.*
Kwebe Hills, 3,400 ft., *Lugard*, 91 ; *Mrs. Lugard*, 98.
A perennial, 1½–2½ ft. high ; corolla snow-white ; stamens with red filaments and yellow anthers ; odour offensive when the plant is bruised.

Labiatae.

Ocimum Knyanum, *Vatke.*
Kwebe Hills, 3,300 ft., *Mrs. Lugard*, 67.
An erect perennial, growing to 18 in. high, strongly aromatic ; flowers mauve.

Ocimum tereticaule, *Poir.*
Kwebe Hills, 3,200 ft., *Lugard*, 96 ; *Mrs. Lugard*, 84.
Plant 1–2 ft. high, perennial, aromatic ; leaves sometimes variegated ; flowers purple.

Orthosiphon Schinzianus, *Briq.*
Kwebe Hills, 3,400 ft., *Lugard*, 140 ; *Mrs. Lugard*, 126.
An erect annual, 1½–2 ft. high, aromatic ; flowers purple ; terminal bracts white or pale purple to dark purple.

Acrotome inflata, *Benth.*
Kwebe Hills, 3,300 ft., *Mrs. Lugard*, 181, 187.
An erect annual, growing to a height of 5 ft. ; flowers very pale mauve.

Leonotis kwebensis, *N. E. Br.* *Folia* petiolata, ovata, dentata, utrinque velutina. *Calyx* apice curvatus, minute pubescens, 8-dentatus ; dentes laterales minores. *Corolla* aurantiaca ; tubus calyce aequilongus ; labium superius 9–10 mm. longum, angustum ; labium inferius 4 mm. longum, trilobum ; lobi oblongi, obtusi, laterales ciliati.

An erect *annual* growing to about 4 ft. in height. *Stems* deeply 4-sulcate with rounded angles in the dried state, covered with a minute dense pubescence, and with a ring of long hairs at each node. *Leaves* spreading, minutely velvety-pubescent on both sides ; petiole ¾–1½ in. long ; blade 2–4 in. long, ⅔–2¼ in. broad (or probably larger), ovate or the uppermost lanceolate, obtusely acute, cuneately acute at the base, evenly dentate. *Verticillasters* densely many-flowered. *Bracts* 2½–6 lin. long, ¼–¾ lin. broad, linear, pungent-mucronate, minutely pubescent. *Calyx* curved at the apex, 8-toothed, minutely pubescent outside and inside, and with some long hairs near the top of the tube outside ; tube 5–6 lin. long, 10-ribbed ; dorsal tooth 2½ lin. long, the two lateral teeth on each side 1 lin. long, and the three lower teeth 1½–1¾ lin. long, all spine-tipped. *Corolla* bright orange or orange-scarlet ; tube about equalling the calyx-tube or slightly exceeding it, 5–6 lin. long, slender, glabrous below and pubescent on the upper part outside, puberulous within in the upper part, and with three equidistant rings of short erect hairs below the middle, the lowest ring about 1 lin. above the base of the tube, the others at a distance of ¾ lin. from each other above it ; upper lip 4½–5 lin. long, narrow, about 1 lin. broad measured sideways, very slightly arched, acute, densely villose-tomentose with orange-scarlet hairs ; lower lip 2 lin. long, 3-lobed, ciliate on the lateral lobes, otherwise glabrous ; lobes

oblong, obtuse, the middle one 1–1½ lin. long, the lateral shorter. *Stamens* inserted at the base of the upper lip of the corolla, and the longer pair almost equalling it in length ; filaments broad and flat, cohering by means of the interwoven hairs with which they are ciliate. *Style* glabrous.

Kwebe Hills, 3,300 ft., *Mrs. Lugard*, 222.

This species is very similar to *L. pallida*, Benth, but is readily distinguished by the orange-scarlet (not pale yellow) colour of the corolla, which is much less gibbous on the back of the upper lip, and has the rings of hairs in its tube placed much nearer to the base than they are in *L. pallida*.

Nyctagineae.

Boerhaavia plumbaginea, *Car.*

By the Lake River, *Lugard*, 14 ; Kwebe Hills, 3,300 ft., *Mrs. Lugard*, 21.

A perennial, growing to a height of 4–6 ft. : flowers white.

Boerhaavia adscendens, *Willd.*

Botletle Valley, *Lugard*, 198.

A swamp weed ; flowers purple. There are only young buds on the specimen, but it appears to be this species.

Boerhaavia pentandra, *Burch.*

Bechuanaland ; near Palapye, 3,000 ft., *Lugard*, 276.

Creeping on the ground ; flowers magenta.

Amarantaceae.

Hermbstaedtia scabra, *Schinz.*

Kwebe Hills, 3,300 ft., *Lugard*, 151 ; *Mrs. Lugard*, 196.

An annual, 2–4 ft. high : flowers pink. This is evidently a dimorphic species, the staminal-tube is longer, and the ovary more attenuated in some specimens than in others ; they probably represent sexual forms.

Hermbstaedtia elegans, *Moq.* var.

Near Bachakuru in the Kalahari Desert, *Lugard*, 236.

Flowers purplish-white.

Sericocoma sericea, *Schinz.*

Kwebe Hills, 3,000 ft., *Lugard*, 181 ; *Mrs. Lugard*, 165.

Annual, growing to 2 ft. high ; flowers green or dirty-white, with the terminal part of the stamens chocolate-coloured.

Sericocoma Bainesii, *Hook. f.*

Kwebe Hills, 3,000 ft., *Mrs. Lugard*, 158.

A perennial, growing to about 18 in. high ; flowers greenish-white.

Sericocoma Welwitschii, *Baker.*

Kwebe Hills, 3,300 ft., *Lugard*, 170 ; *Mrs. Lugard*, 221.

Plant growing to 2½ ft. high ; flowers greenish-white, becoming cream-coloured. The two specimens quoted are very different in appearance, but I believe them to be the same species in different stages of development.

Pupalia lappacea, *Moq.*
Kwebe, *Lugard*, 175.
Flowers greenish-white.

Ærua javanica, *Juss.*
Kwebe, *Lugard*, 180.

Pandiaka deserti, *N. E. Br.* *Herbacea*, ramis albo-striatis. *Folia* opposita, lanceolata vel lineari-lanceolata, spinescenti-acuta, crispato-undulata. *Capitula* subglobosa, pluriflora. *Flores* 4 lin. longi. *Ovarium* compresso-globosum.

Herb, with opposite diverging striate branches, the striae filled with white wool. *Leaves* opposite, $\frac{2}{3}$–1 in. long, 1–3 lin. broad, lanceolate or linear-lanceolate, acute, tipped with a small spine, subsessile or narrowed into a short petiole at the base, crisped on the margins, at first covered with a minute white wool, becoming more or less glabrous. *Flowers* all hermaphrodite, in terminal subglobose heads, sessile between a pair of small leaves, pink or becoming pale ochreous in the dried state. *Bracts* solitary under each flower, $1\frac{3}{4}$–$2\frac{1}{2}$ lin. long, $\frac{3}{4}$–$1\frac{1}{4}$ lin. broad, ovate, acuminate into a stiff arista, chaffy or submembranous, thinly cottony or cobwebby. *Perianth* segments 5, slightly unequal, $3\frac{1}{2}$–4 lin. long, $\frac{2}{3}$–$\frac{7}{8}$ lin. broad at the base, thence gradually tapering to a very acute subpungent point, submembranous, with a thick rigid midrib, thinly cottony or cobwebby. *Stamens* 5, included, alternating and connate with 5 subquadrate or ovate-oblong irregularly 3-toothed membranous staminodia, forming a cup $\frac{3}{4}$ lin. long, the free part of the filaments 1–$1\frac{1}{2}$ lin. long; anthers $\frac{1}{3}$ lin. long, oblong. *Ovary* subglobose or obovoid, rounded or subtruncate at the top; style $1\frac{2}{3}$–2 lin. long, filiform, stigma simple, slightly thickened. *Ovule* solitary, pendulous from a long erect basal funicle.

Northern Kalahari Desert; near Chukutsa Salt-pan, *Lugard*, 221.

Phytolaccaceae.

Microtea tenuissima, *N. E. Br.* *Lophiocarpus tenuissimus*, Hook. f. Ic. Pl. xv., p. 50, t. 1,463, f. 10–11.

Okavango Valley, 3,000 ft., *Lugard*, 277. German South-West Africa: Amboland; Omupanda, *Wulfhorst*, 33; Oshando, *Schinz*, 900.

When Turczaninow established the genus *Lophiocarpus* he placed it in the order *Chenopodiaceae*, and it has been retained as a distinct genus in that order until the present time, its identity with the genus *Microtea* having been overlooked. Sir Joseph Hooker, however, when describing this species and *L. Burchellii*, Hook. f., in the *Icones Plantarum*, as cited above, expresses a doubt as to whether *Lophiocarpus* should not be transferred to *Phytolaccaceae*, and Volkens in *Engler & Prantl Pflanzenfam.*, iii., i., A, p. 90, without further investigation, reiterates the same opinion.

In structure and habit *Lophiocarpus* quite agrees with *Microtea*, whilst in general appearance the two species figured in the *Icones Plantarum* are similar to *Microtea tenuifolia*, but are more rigid.

With regard to the natural order to which the genus belongs, there is no doubt that its affinity is with *Rivina* and *Monococcus*, and it therefore is rightly placed in *Phytolaccaceae*.

As the name *Lophiocarpus* has to be abolished, the following is the synonymy of the two remaining species placed under that genus.

Microtea Burchellii, *N. E. Br.* *Lophiocarpus Burchellii*, Hook. f., in Benth & Hook. f. Gen. Pl. iii., p. 50, and Ic. Pl., xv., t. 1,463.

South Africa: Griqualand West; at Griqua Town, *Burchell*, 1934. Bechuanaland; Batlapin Territory (Vryburg District) *Holub*!

Microtea polystachya, *N. E. Br.* *Lophiocarpus polystachyus*, Turcz. in Bull. Soc. Nat. Mosc. xvi., p. 56. *Wallinia polystachya*, Moq. in DC. Prod. xiii., pt. 2, p. 143.

South Africa: Little Namaqualand; by the Orange River, near Verleptpram. *Drège*, 2940!

Polygonaceae.

Oxygonum alatum, *Burch.*

Kwebe Hills, 3,300 ft., *Lugard*, 89, 90; *Mrs. Lugard*, 109.

Flowers white.

Thymelaeaceae.

Arthrosolen polycephalus, *C. A. Mey.*

Botletle River Flats, 3,000 ft., *Mrs. Lugard*, 4.

Perennial plant, 2 ft. high; flowers yellow, with a very powerful scent.

Loranthaceae.

Loranthus namaquensis, *Harv.*

Bechuanaland; at Keria, growing upon *Pluchea Leubnitziae*, N. E. Br., *Lugard*, 1; Kwebe Hills, 3,000 ft., growing chiefly upon Acacia trees, *Mrs. Lugard*, 228.

Flowers scarlet; fruit red.

Loranthus Dregei, *Eckl. & Zeyh.* var.

Totin, near Lake Ngami, parasitic upon Acacia, *Lugard*, 30; Kwebe Hills, 3,300 ft., *Mrs. Lugard*, 44.

Flowers whitish-grey or greenish-cream; fruit bright red when ripe.

Loranthus Lugardi, *N. E. Br.* *Folia* parva, oblonga, obtusa, basi cuneata, brevissime petiolata, minute puberula. *Flores* axillares, fasciculati, sessiles. *Bractea* cupuliformis, truncata, ciliolata. *Calycis limbus* breviter tubulosus, truncatus, ciliolatus. *Corolla* anguste cylindrica, viridis, fere ad medium unilateraliter fissa, superne 5-loba; lobi anguste lineari-spathulati, obtusi, erecti. *Bacca* ellipsoidea, lutea, apice rubra.

Flowering branchlets 1–1$\frac{1}{3}$ lin. thick, greyish-brown, puberulous. *Leaves* alternate, 1–5 lin. apart, $\frac{1}{2}$–1$\frac{1}{3}$ in. long, 1$\frac{3}{4}$–4$\frac{1}{2}$ lin. broad, oblong or cuneate-oblong, obtuse, cuneately narrowed into a very short petiole at the base or subsessile, rather thick and rigidly coriaceous in the dried state, minutely puberulous. *Flowers* in

axillary clusters of 2–5, sessile. *Bract* 1 lin. long, cup-shaped, subtruncate, indistinctly crenate or slightly notched on one side, minutely ciliate, otherwise glabrous, light green. *Calyx* 1⅓–1½ lin. long, of which 1 lin. belongs to the tubular, truncate, minutely ciliate, light green limb. *Corolla* 1½ in. long, slender, cylindric, straight, about ¾ lin. in diam., slightly enlarged to about 1 lin. in diam. just below the obtuse apex; when in bud whitish below, light green in the upper part, with 5 purple-brown stripes inside the upper part of the tube; when open, it is split to about half-way down on one side, and divided above into 5 linear-spathulate, erect or reflexed lobes 5 lin. long, ½ lin. broad near the apex. *Stamens* abruptly inflexed, glabrous; filaments about ¼ in. long; anthers 1⅓–1½ lin. long, linear, basifixed, yellow. *Style* about as long as the corolla, filiform, glabrous; stigma sub-globose. *Berries* about ⅓ in. long, ellipsoid, yellow for ¾ of their length, red at the apex, crowned with the persistent calyx-limb.

Kwebe Hills, 3,000–3,500 ft., *Mrs. Lugard*, 20; Totin, near Lake Ngami, *Lugard*, 32.

This species is allied to *L. oleaefolius*, Ch. & Sch., but differs in having rather smaller leaves and sessile flowers. According to Mrs. Lugard, it grows chiefly upon Acacia trees.

Loranthus splendens, *N. E. Br.* Omnino glaber. *Folia* coriacea, oblonga, obtusissima, basi cuneata. *Cymae* multiflorae. *Bracteae* obliquae, ovatae, acutae, dorso gibbosae. *Ovarium* 5–6 mm. longum, obconicum. *Calycis limbus* 1 mm. longus, truncatus. *Corolla* curvata, basi oblique gibbosa, infra mediam fissa; petala 5 cm. longa, linearia, acuta, basi intus plicata, ad media voluta. *Stamina* procurva; antherae lineares, basifixae.

Quite glabrous in all parts, apparently overspread with a glaucous bloom on the purplish-grey branches, foliage, and green parts of the cymes. *Leaves* alternate, petiolate, rigidly coriaceous; petiole 2 lin. long; blade 1½–2½ in. long, 5–10 lin. broad, oblong, very obtuse, shortly cuneate at the base, 3–5-nerved. *Cymes* apparently produced on the leafless parts of the branches, 2–25-flowered. *Peduncles* 0–4 lin. long. *Pedicels* 4–5½ lin. long. *Bracts* oblique, very shortly cupular at the base, produced on one side into an ovate acute limb ¼ lin. long, gibbous on the back. *Ovary* 2½–3 lin. long, obconic, about 2 lin. in diam. at the top. *Calyx-limb* ½ lin. long, cupular or annular, truncate. *Corolla* when in mature bud about 2 in. long (following the curve), very oblique and curved at the base, which is gibbous in front and at that part about ¼ in. in diam., the middle part is cylindric, nearly straight and about 1 lin. in diam., the upper part is very much curved forward, clavate, obtuse and about 1¾ lin. in diam.; when expanded, the corolla is obliquely divided to about 5 lin. above the base into 5 linear acute channelled petals, which are rather broader in the upper part than at the middle, where they spirally coil themselves up and intermingle. In the basal part they are so slightly connate as to become quite free in the process of drying, and have several oblique folds or ridges within; in the living state the corolla is of a brilliant carmine, fading into orange towards the tips of the petals, but when dried the whole corolla is of an ochreous tint. *Stamens* equalling the corolla, their free part 1¾ in. long, curved forwards, brilliant

carmine, glabrous, anthers linear, basifixed. *Style* 2 in. long or rather more, brilliant carmine, glabrous, stigma capitate.

Okavango Valley, 3,000 ft., parasitic upon *Acacia horrida*, *Lugard*, 232.

This brilliantly coloured species is closely allied to *L. curviflorus*, Benth. (which ranges from Arabia, through Nubia, and down the eastern side of Africa, to the northern part of German East Africa), and is evidently the western representative of that species. It differs from *L. curviflorus* in its much broader leaves, much larger and stouter flowers, and especially in the ovary which is at least twice as long as that of *L. curviflorus*, and much stouter.

Santalaceae.

Thesium dissitum, *N. E. Br.* *Herba* nana, erecta, 12–15 cm. alta, omnino glabra, ramosa. *Rami* brevi, erecti, cauli subparalleli. *Folia* 9–23 mm. longa, anguste linearia, acuta, dorso carinata incurvo-erecta, glabra. *Paniculus* vel pseudo-racemus parvus, 1·5–2·5 cm. longus, ramulis 1–4 mm. longis, apice 1–3-floris. *Flores* sessiles, 3-bracteati. *Bracteae* inaequales, 1·5–10 mm. longi. *Perianthium* 3 mm. longum, lobis 1·5 mm. longis, lanceolatis, acutis, apice intra pilis paucis crispulis ornatis. *Fructus* ignotus.

Bechuanaland; Kalahari Desert, near Mamunwe, *Lugard*, 239.

This is not very similar in appearance to any other Tropical or South African species. The flowers, according to Lugard, are brownish-yellow.

Euphorbiaceae.

Euphorbia kwebensis, *N. E. Br.* *Annua*, ramosa, glabra. *Folia* linearia vel anguste lineari-oblonga, apice minute tridenticulata. *Involucra* solitaria in furcis supremis ramorum, breviter pedunculata, campanulata. *Glandulae* integrae, transverse oblongae, supra transversim carinatae. *Bracteolae* filiformes. *Styli* bifidi. *Semina* carunculata, oblonga, compressa, rugosa, dealbata.

An annual *herb*, 6–15 in. high, somewhat corymbosely branched, glabrous on all parts except inside the involucre under the glands, and sometimes on the ovary and capsule. *Leaves* mostly opposite, but with 3 in a whorl at the top of the main stem where it branches into 3, and occasionally there are 1 or more alternate on the same plant, spreading; petiole 1–3 lin. long; blade 1–2 in. long, $1\frac{1}{3}$–$3\frac{1}{2}$ lin. broad, linear or narrowly linear-oblong, obtuse and minutely 3-toothed at the apex, cuneate at the base. *Stipular line* bearing 2–3 minute subulate processes (glands ?). *Involucre* solitary in the forks of the branches or terminal, shortly pedicellate, campanulate, $\frac{3}{4}$ lin. long, about 1 lin. in diam., divided at the top into 4 short oblong fimbriate lobes, alternating with 4 transversely oblong entire glands $\frac{1}{2}$ lin. broad, marked with a transverse ridge on their face, pubescent beneath on the inner side. *Pedicel* $\frac{1}{2}$–$\frac{3}{4}$ lin. long. *Bracteoles* between the stamens filiform, entire. *Ovary* and *capsule* glabrous or thinly covered with very short stout hair-like processes; styles bifid, glabrous, red. *Seeds* $1\frac{1}{4}$–$1\frac{1}{3}$ lin. long, carunculate, oblong, flattened, very rugose, white or faintly bluish-white; caruncle pale yellowish.

Kwebe Hills, 3,300 ft., *Lugard*, 143; *Mrs. Lugard*, 81.

A very distinct species, unlike any other from Tropical Africa that I have seen; it is, perhaps, nearest allied to *E. dracunculoides*, Lam., but the 3-toothed leaves and very different glands of the involucre readily distinguish it. In general appearance it may be likened to *E. macra*, Hiern, from which it abundantly differs in its annual habit and broader 3-toothed leaves.

Euphorbia crotonoides, *Boiss.* in DC. Prodr. xv., pt. 2, p. 98.

This would appear to be a rare plant. It was originally discovered in 1837, near El Obeid, in Cordofan, by Kotschy, and the species was founded upon his specimens; no other collector, so far as I am aware, has again found the plant until Captain and Mrs. Lugard sent it to Kew from Ngamiland, a region more than 2,000 miles south of the locality where it was originally discovered. Yet annuals are frequently widely distributed, and it may have been overlooked by other collectors, but as it grows 1–1½ ft. in height, with very spreading branches and large leaves, it ought to be sufficiently conspicuous wherever it is present. However, its discovery in Ngamiland is an interesting one, and widely extends its range. Specifically, it is nearly allied to *E. systyla*, Edgew., differing in its angular stem, serrate leaves (which are remarkably winged along the midrib beneath), and in the villous fruit.

Kwebe Hills, 3,300 ft. alt., *Lugard*, 160; *Mrs. Lugard*, 183.

Euphorbia Monteiri, *Hook. f.*

Tontin, near Lake Ngami, *Lugard*, 75; Kwebe Hills, 3,300 ft., *Lugard*, 247; *Mrs. Lugard*, 87.

An erect succulent perennial, with a stem up to about 1 ft. high, then branching out annually into fresh green stalks bearing foliage and flowers; flowers maroon-coloured; fruit green.

Monadenium Lugardae, *N. E. Br.* *Frutex* carnosus, ramosus; rami teretes, crassi, subtuberculati. *Folia* 1·3–3·8 cm. longa, obovata, subacuta, minutissime crenulata, puberula. *Cymae* ad apicem ramorum confertae, simpliciter trichotomae. *Involucra* brevissime pedicellata, bracteis vix longiora, subcampanulata, truncata, uno latere ad medium fissa, intra 5 lobis subrectangularibus fimbriatis membranaceis instructa. *Ovarium* pedicillatum, reflexum, acute trigonum, angulis biseriatim crispatulo-cristatis.

A branched *succulent plant* about 2 ft. high. *Branches* ¾–1 in. thick, cylindric, covered with large rhombic very slightly projecting tubercles 4–6 lin. long, 4–5 lin. broad, glabrous. *Leaves* appearing before the flowers, tufted at the tips of the branches, ⅔–1½ in. long, 3–7 lin. broad, obovate, obtuse or subacute, tapering below into a short broad petiole, minutely and irregularly crispate-crenulate, minutely pubescent all over. *Cymes* clustered at the tips of the branches, simply trichotomous; primary peduncles 1½–3 lin. long; secondary peduncles or branches of the cyme ¾–1 lin. long. *Bracts* 2–3½ lin. long, 3–4 lin. broad, amplexicaul, embracing the involucre and about as long as it, shortly and obtusely bifid at the apex, minutely puberulous. *Involucre* about 1½ lin. long, subcampanulate, truncate, entire, open down one side, glabrous, light green, with an orange-brown margin, furnished within with five membranous, white, broadly oblong, concave, fimbriate lobes, which

subtend the five clusters of stamens or male flowers. *Ovary* and *capsule* pedicellate, somewhat acutely 3-angled and with two narrow minutely crispate-denticulate russet-coloured wings along each angle, minutely puberulous. *Seeds* about $1\frac{3}{4}$ lin. long, carunculate, oblong, 4-angled, white, minutely and rather obscurely tuberculate; caruncle ochreous-yellow.

Kwebe Hills, 3,500 ft., rare, only one bed of it, consisting of a large number of plants, found at the foot of Kwebe Peak, *Mrs. Lugard*, 22.

According to a note on Mrs. Lugard's drawing of this plant, the leaves are developed from February to May, and the flowers in August.

Phyllanthus Niruri, *Linn.*

Kwebe Hills, 3,500 ft., *Mrs. Lugard*, 80; *Lugard*, 155.

Jatropha humilis, *N. E. Br.* *Herba* pubescens. *Rami* decumbentes vel patentissimi. *Folia* petiolata, oblonga vel oblongo-lanceolata, acuta, basi obtusa vel rotundata. *Cymae* terminales, multiflorae. *Calyx* infra medium 5-lobus; lobi oblongi, acuti. *Petala* oblanceolata vel spathulata-oblanceolata, obtusa, glabra. *Discus* 5-partitus.

A dwarf perennial *herb*, probably tuberous. *Underground stem* brown, glabrous, bearing a few minute deltoid scales, branching at the surface into 2–6 or more decumbent or widely spreading simple leafy branches 2–$3\frac{1}{2}$ in. long, softly pubescent with short spreading hairs. *Leaves* alternate, exstipulate; petiole $1\frac{1}{2}$–5 lin. long, pubescent; blade 1–$2\frac{3}{4}$ in. long, $\frac{1}{2}$–$1\frac{1}{4}$ in. broad, all oblong or oblong-lanceolate, acute, obtusely rounded at the base, or one or more of the lower leaves lobed on one or on both sides, thinly pubescent on both sides with short spreading hairs. *Inflorescence* cymose, pubescent, many-flowered, terminal at the centre of the plant, leafless, the leafy branches not producing flowers. *Male flowers* numerous, somewhat crowded. *Female flowers* few, solitary at the base of the main divisions of the inflorescence. *Bracts* $\frac{2}{3}$–$1\frac{3}{4}$ lin. long, lanceolate or subulate, acute, toothed or entire at the base. *Pedicels* $\frac{1}{3}$–$1\frac{1}{2}$ lin. long. *Calyx* of the male flowers 1–$1\frac{1}{4}$ lin. long, of the female flowers $1\frac{1}{2}$–$1\frac{2}{3}$ lin. long, 5-lobed to below the middle, glabrous or pubescent, lobes erect, oblong, obtuse or subacute. *Petals* of the male flowers $2\frac{3}{4}$ lin. long, $\frac{2}{3}$ lin. broad; of the female flowers $2\frac{3}{4}$–$3\frac{1}{2}$ lin. long, $\frac{2}{3}$ lin. broad, oblanceolate or spathulate-oblanceolate, obtuse, yellow or purple, glabrous. *Stamens* 5–6, free, shorter than the petals, absent in the female flowers. *Disk* of five very obtuse or subtruncate lobes. *Ovary* about as long as the calyx, pubescent; styles 3, bifid, $1\frac{1}{4}$–$1\frac{1}{2}$ lin. long, glabrous or slightly pubescent at the base. *Capsule* subglobose, 6–7 lin. in diam., pubescent.

Kwebe, *Lugard* 56, 159.

A very distinct species belonging to the same group as *J. Zeyheri*, Sond., and *J. natalensis*, Müll.-Arg.

Croton zambesicus, *Müll.-Arg.*

Kwebe, *Lugard*, 246.

Croton amabilis, *Müll.-Arg.*

Kwebe Hills, 3,400 ft., *Lugard*, 33 ; *Mrs. Lugard*, 35.

According to Mrs. Lugard's note it is "a bushy tree up to 15 ft. high ; remains in bud all the dry season, looking quite dead and dried up, with the first rains it suddenly bursts into full flower ; flowers yellow." According to Lugard :—"A shrub 3–4 ft. high, flowers at the end of November ; flowers yellowish-green, sweet scented."

Croton megalobotrys, *Müll.-Arg.*

Lake River, *Lugard*, 17.

A tree, attaining 30 ft. in height ; flowers green.

Croton kwebensis, *N. E. Br.* *Frutex* ramosus ; ramuli graciles, dense tomentosi. *Folia* petiolata, oblonga, elongato-ovata vel elliptico-oblonga, supra viridia, tenuiter stellato-pubescentia, subtus dense argenteo-lepidota. *Racemi* terminales, subfulvescenti-lepidoti. *Flores* pedicellati ; *masculi* plures, superiores ; calyx profunde 5-lobus, lobis ovatis incurvato-patentibus intus glabris ; petala anguste oblanceolata, hirta, recurva ; stamina 15 : *feminei* inferiores, pauci vel nulli ; calyx infra medium 5-lobus, lobi oblongi, subacuti vel obtusi, intra pubescentes ; petala et stamina nulla ; ovarium lepidotum ; styli 3–4, profunde bifidi, glabri.

A woody *shrub*, 3–6 ft. high, much branched. *Branchlets* slender, densely tomentose with stellate hairs, which arise from the centre of orbicular scales, pale fulvous ; at length becoming glabrous, with a grey bark. *Leaves* shortly petiolate ; petiole ¾–1 lin. long, tomentose like the branchlets ; blade ½–2¼ in. long, ¼–1 in. broad, oblong, elliptic-oblong, elongate-ovate or oblong-ovate, green and thinly covered with simple, forked and stellate hairs on the upper surface, densely covered with silvery orbicular scales beneath. *Racemes* terminal, ¾–2½ in. long, 5–15-flowered, everywhere covered with orbicular scales and stellate hairs intermingled, of a pale fulvous colour. *Flowers* all male, or 1–3 at the base of the raceme female. *Bracts* minute, ⅓–½ in. long. *Male flowers :* pedicels 2–3½ lin. long ; calyx 5-lobed almost to the base ; lobes 1 lin. long, ⅔ lin. broad, ovate, subacute, spreading-incurved, glabrous within ; petals 1¼–1⅓ lin. long, ⅓ lin. broad, narrowly oblanceolate, obtuse or acute, shortly hairy on the inner surface and ciliate, spreading and recurved between the sepals ; stamens 15, some of them often with abortive anthers ; filaments slightly hairy ; disk pilose. *Female flowers :* pedicels 1–1½ lin. long ; calyx 5-lobed to two-thirds of the way down ; lobes ¾ lin. long, about ⅔ lin. broad, oblong, subacute or obtuse, incurved at the tips, pubescent within ; petals and stamens none ; ovary densely covered with light fulvous orbicular scales ; styles 3–4, deeply bifid, glabrous, dull purple.

Kwebe Hills, 3,300 ft., *Lugard*, 34 ; *Mrs. Lugard*, 41.

Cephalocroton mollis, *Kl.* var. **pilosa**, *Schinz.*

Kwebe Hills, 3,000 ft., *Mrs. Lugard*, 70.

A shrub, up to 4 ft. high ; perianth green, stamens and stigmas yellow according to Mrs. Lugard's drawing.

Claoxylon virens, *N. E. Br.* *Frutex* omnino molliter pubescens. *Folia* breviter petiolata, ovata vel lanceolata, obtuse acuta, subintegra vel paucidentata. *Racemi* masculi pedunculati, compacto-

densiflori. *Pedicelli* filiformes. *Sepala* 4–5, valvata, lanceolata, acuta, recurva. *Stamina* circa rudimentum ovarii inserta, 2–5 perfecta, 5–10 staminodiis clavatis circumdata. *Flores feminei* ignoti.

A much branched *shrub*, 3–4 ft. high, with a pale grey bark; young shoots, both sides of the leaves, peduncles, pedicels and outside of the calyx all softly pubescent with short spreading hairs. *Leaves* alternate, herbaceous, green on both sides; petiole 1–1½ lin. long; blade ½–2 in. long, 3–11 lin. broad, lanceolate to ovate, tapering to a somewhat obtuse point, rounded at the base, subentire or with one or a few teeth on each margin, chiefly on the basal half. *Racemes* pedunculate, axillary, ⅓–1⅙ in. long, bearing 2–5 crowded clusters of very small green flowers at the apical part. *Pedicels* 1–2 lin. long, hair-like. *Sepals* 4–5, valvate in bud, ½–⅔ lin. long, ⅕–⅙ lin. broad, lanceolate or linear-lanceolate, acute, very spreading, recurved at the tips. *Staminodia* 5–10, clavate, without anthers, surrounding the stamens. *Perfect stamens* 2–5, surrounding a rudimentary ovary; filaments about ⅛ lin. long, glabrous; anther-cells nearly as long as the filaments, free to the base, somewhat divergent, opening by longitudinal slits. *Female flowers* not seen.

Kwebe Hills, 3,400 ft., *Lugard*, 53, 94; *Mrs. Lugard*, 51.

Acalypha ciliata, *Forsk.*

Kwebe Hills, 3,300 ft., *Mrs. Lugard*, 184A; *Lugard*, 154.

An erect annual, to 15 in. high; flowers green; anthers yellow.

Acalypha indica, *L.*

Kwebe Hills, 3,300 ft., *Mrs. Lugard*, 184, and 137—a small variety.

An annual, to 12 in. high; flowers green, and red and green.

Ricinus communis, *L.*

By the Botletle River at Sebituane's Drift, and also on the Kwebe Hills, 3,000–3,300 ft., *Mrs. Lugard*, 1.

Found close to water, grows to 7 ft. high.

Tragia cordifolia, *Benth.*

Kwebe Hills, 3,300 ft., *Lugard*, 66; *Mrs. Lugard*, 61.

HYDROCHARIDACEAE.

***Boottia muricata**, *Wright* in Fl. Trop. Afr. vii., p. 569.

Botletle River, *Lugard*, 13: Okavango River, 3,000 ft., *Lugard*, 279.

Petals white; stamens yellow.

ORCHIDACEAE.

Lissochilus Wakefieldii, *Reichb. f.*

Botletle Valley, 3,000 ft., *Lugard*, 281.

Flowers yellow.

***Habenaria Lugardii**, *Rolfe* in Fl. Trop. Afr. vii., p. 228.

Botletle Valley, *Lugard*, 215.

Flowers white.

Haemodoraceae.

Sansevieria, species doubtful, portion of a leaf and inflorescence only.

Banks of the Botletle River, 3,000 ft., *Mrs. Lugard*, 9.

Flowers green.

Iridaceae.

***Ferraria bechuanica**, *Baker* in Fl. Trop. Afr. vii., p. 344.

Near Kwebe Hills, *Lugard*, 282; Kalahari Desert; near Mamunwe, *Lugard*, 237.

Petals chocolate.

Lapeyrousia Bainesii, *Baker*.

Kwebe, *Lugard*, 179; near Bachakuru, *Lugard*, 242.

Flowers white, with a chocolate spot at the base of the lower segments, strongly scented.

***Lapeyrousia porphyrosiphon**, *Baker* in Fl. Trop. Afr. vii., p. 353.

Kalahari Desert; near Mamunwe, *Lugard*, 238.

Flowers pure white, with a purple-tinted tube.

Amaryllidaceae.

***Crinum Lugardae**, *N. E. Br.* in Gard. Chron. 1903, xxxiv., p. 49.

Kwebe Hills, 3,300 ft., *Mrs. Lugard*, 43.

Flowers 2–6 together, white, with a pink medium stripe down each segment.

Crinum crassicaule, *Baker*, Amaryll. p. 85. *Bulb* globose, "24 inches in circumference," without a distinct neck. *Leaves* 8–10 to a bulb, "5 inches broad," ciliate, at least on the basal part, their length and outline undeterminable, as (according to the drawings) the upper part has decayed and become torn off when the plant is in flower. *Scapes* 1–2 to a bulb, arising at the side of the rosette of leaves, about 4–6 in. long and 1–1¼ in. across their greatest diameter, compressed, 8–12-flowered. Outer *bracts* about 3½ in. long and 1 in. or more broad, lanceolate, acute, reflexed; inner bracts 1–1½ in. long, linear to linear-filiform. *Pedicels* 1–8 lin. long. *Ovary* ellipsoid, about ¾ in. long. *Perianth-tube* 3½–4½ in. long, slightly curved or straight, cylindric, greenish; limb funnel-shaped, white, with a rosy stripe down the middle of the segments, which are 4–4¾ in. long, ⅞–1 in. broad, lanceolate, acute, suberect, recurved-spreading at the tips. *Stamens* 2½–3 in. long; filaments white, anthers yellowish. *Style* exserted about 1 in. beyond the stamens, pink; stigma minutely 3-lobed.

Ngamiland: Koobie (Kobis), *Baines*; Kwebe Hills, 3,500 ft., *Mrs. Lugard*, 45.

As this species was originally described from incomplete material and has been omitted from the Flora of Tropical Africa, I have given the above amended description, compiled from the very careful drawings of Mrs. Lugard and Mr. Baines and their notes and specimens, which latter are unfortunately without leaves.

***Crinum rhodanthum,** *Baker* in Fl. Trop. Afr. vii., p. 397.
Kwebe Hills, 3,300 ft., *Lugard*, 40 ; *Mrs. Lugard*, 42.
Leaves large, spreading close to the ground ; flowers pink to carmine.

Crinum sp. ; flowers only.
Okavango Valley, in inundated places, about 3,000 ft., *Lugard*, 284.

Pancratium Chapmanni, *Harv.*
Kwebe Hills, 3,300–3,400 ft., *Mrs. Lugard*, 36 ; *Lugard*, 39 ; near Lake Ngami, *McCabe*, 35.
Leaves very twisted ; flowers white, opening towards evening.
This is quite distinct from *P. trianthum*, Herb., with which it has been united in the Flora of Tropical Africa.

Liliaceae.

***Asparagus conglomeratus,** *Baker* in Fl. Trop. Afr. vii., p. 428.
Kwebe, *Lugard*, 52.
Flowers white.

***Asparagus bechuanicus,** *Baker* in Fl. Trop. Afr. vii., p. 429.
Nakalechwe, *Lugard*, 25.

***Asparagus Lugardi,** *Baker* in Fl. Trop. Afr. vii., p. 431.
Near Lake Ngami, *Lugard*, 31.
Flowers dull white.

Asparagus asiaticus, *L.*
Kwebe Hills, 3,300 ft., *Mrs. Lugard*, 40.
Flowers white.

Asparagus racemosus, *Willd.*
Nakalechwe, *Lugard*, 25A.

***Aloe Lugardiana,** *Baker* in Kew Bull. 1901, p. 135.
By the Botletle River at Sebituane's Drift, 3,000 ft., *Mrs. Lugard*, 2.
Leaves up to 1 ft. long and $1\frac{3}{4}$ in. broad, spotted with whitish ; flower-stem up to 3 ft. high ; flowers red.

***Eriospermum bechuanicum,** *Baker* in Fl. Trop. Afr. vii., p. 472.
Near Kwebe, *Lugard*, 80.
Flowers greyish-white.

***Eriospermum sphaerophyllum,** *Baker* in Fl. Trop. Afr. vii., p. 472.
Kwebe Hills, 3,000 ft., *Lugard*, 78, 285.
Flowers whitish-green.

***Anthericum flavoviride,** *Baker* in Fl. Trop. Afr. vii., p. 490.
Botletle Valley, *Lugard*, 194 ; Okavango Valley, about 3,000 ft., *Lugard*, 286.
Erect, 18 in. high, growing in sand ; flowers bright yellow.

Anthericum laxum, *N. E. Br.* *Folia* 45–50 cm. vel ultra longa, 2 mm. crassa, teretia, glabra. *Scapus* 60–70 cm. altus, superne laxe paniculato-ramosus, glaber, laevis, nudus. *Bracteae* membranaceae, 2 mm. longae, late ovatae, mucronatae. *Flores* distantes,

racemosi, erecti. *Pedicelli* 3–8 mm. longi, apice articulati. *Perianthium* 7 mm. longum, albidum. *Filamenta* staminum deflexo-scabrido-pubescentia.

Leaves $1\frac{1}{2}$–$1\frac{2}{3}$ ft. or more long, about 1 lin. thick, terete, smooth, glabrous. *Flower-stem* 2–$2\frac{1}{3}$ ft. high, laxly paniculately branched above the middle, with spreading branches $4\frac{3}{4}$–$6\frac{3}{4}$ in. long, smooth, glabrous, leafless. *Bracts* membranous, about 1 lin. long, broadly ovate, mucronate. *Flowers* racemose, solitary, rather distant. *Pedicels* suberect, $1\frac{1}{2}$–4 lin. long, jointed at the apex, smooth, glabrous. *Perianth* about $3\frac{1}{2}$ lin. long, "dirty white" (*Lugard*), with oblong, obtuse segments. *Stamens* shorter than the perianth, with the filaments densely scabrid-pubescent with short deflexed hairs.

Kalahari Desert; near Bachakuru, *Lugard*, 234.

This species is closely allied to and much resembles *A. pallidiflavum*, Engl. & Gilg, but has much stouter leaves, very much shorter, erect (not spreading) pedicels, and smaller flowers.

***Dipcadi platyphyllum**, *Baker* in Fl. Trop. Afr. vii., p. 518.
Kwebe, *Lugard*, 44.
Flowers green.

***Dipcadi firmifolium**, *Baker* in Fl. Trop. Afr. vii., p. 519.
Kwebe Hills, 3,300 ft., *Lugard*, 57; *Mrs. Lugard*, 64.
Flowers green.

***Dipcadi magnum**, *Baker* in Fl. Trop. Afr. vii. p. 522.
Kwebe Hills, 3,400 ft., *Lugard*, 88; *Mrs. Lugard*, 76.
Flowers dull green.

***Dipcadi vaginatum**, *Baker* in Fl. Trop. Afr. vii. p. 523.
Kwebe Hills, 3,200 ft., *Lugard*, 47; *Mrs. Lugard*, 56.
Each bulb with a single leaf; flowers green.

***Dipcadi brevipes**, *Baker* in Kew Bull. 1901, p. 136.
Kwebe Hills, 3,300 ft., *Mrs. Lugard*, 65.
Flowers green.

Albuca Bainesii, *Baker*.—*A. Lugardi*, Baker in Fl. Trop. Afr. vii. 533.

Kobis to North Shaw Valley, *Baines*. Kwebe Hills, 3,200 ft., *Mrs. Lugard*, 182; Botletle Valley, *Lugard*, 216.

I am quite unable to find any distinction whatever between *A. Bainesii* and *A. Lugardi*. The type of *A. Bainesii* consists of one leaf and two bits of inflorescence, the latter is identical with the inflorescence of *A. Lugardi*; the leaf is quite glabrous, whilst the leaves of Capt. and Mrs. Lugard's specimens represent various stages from completely glabrous to thinly pilose with long spreading hairs on the back. To the descriptions already published may be added the following particulars:—*Leaves* $2\frac{1}{2}$–3 ft. long, $\frac{1}{3}$–$1\frac{1}{4}$ in. broad, deeply concave-channelled down the face, glabrous or with few or many spreading hairs on the back, and sometimes ciliate. *Flower-stem* 3–5 ft. high. Lower *bracts* 1–$4\frac{1}{2}$ in. long, and always much longer than the pedicels, not equalling them as originally described. Lower *pedicels* $\frac{1}{2}$–1 in. long. The *flowers*, according to Mrs. Lugard's drawing, are greenish-yellow, with a broad stripe of darker green down the back of each segment.

long and broad, 3–5-lobed, cordate at the base, with a broad open sinus twice as broad as deep; scaberulous-pubescent on both sides; lobes oblong or rounded, acute or obtuse, acutely denticulate. *Tendrils* simple, puberulous. *Male flowers* in pedunculate corymbs which elongate into racemes that are shorter than the leaves; peduncle $\frac{3}{4}$–1 in. long, puberulous; pedicels 3–4 lin. long, slender, puberulous; calyx 5-lobed, pubescent outside; tube 1 lin. long, campanulate, with a ring of woolly hairs at the mouth inside; lobes 2 lin. long, $\frac{1}{2}$ lin. broad at the base, lanceolate-attenuate or subulate, 1–2-toothed on each side or entire; petals free, $1\frac{3}{4}$ lin. long, 1 lin. broad, oblong, obtuse, pubescent on the back, glandular on the inner face, yellow; stamens inserted at the mouth of the tube; filaments free or more or less connate, $\frac{1}{3}$ lin. long; anthers $\frac{3}{4}$ lin. long, free or more or less connate, very much curved. *Female flowers* solitary: pedicels $1\frac{1}{2}$–2 lin. long, pubescent; ovary $\frac{1}{2}$–$\frac{3}{4}$ lin. long, narrowly fusiform, pubescent; calyx and corolla as in the male flowers; style about 2 lin. long, its upper part concealed by the reflexed, entire, thimble-shaped stigma. *Fruit* according to Mrs. Lugard's drawing, 3–$3\frac{1}{2}$ in. long and $\frac{3}{4}$ in. thick when ripe, fusiform or cylindric, tapering into a beak, smooth, at first green, afterwards becoming bright red, dotted with white; flesh orange-yellow; seeds ellipsoid, deep carmine.

Kwebe Hills, 3,300 ft., *Mrs. Lugard*, 54.

This is readily distinguished from *T. natalensis*, Hook. f., by its more deeply lobed leaves with more acute lobes, the shorter male inflorescence, and the short pedicels of the female flowers.

Toxanthera kwebensis, *N. E. Br.* *Herba* scandens, monoica, scabrido-pubescens, *T. Lugardae* similis, sed foliis integris orbiculato-cordatis apice abrupte et breviter acutis, cirrhis bifidis et floribus majoribus differt.

Plant very similar to the preceding species in habit and pubescence, but stouter. *Leaves* petiolate; petiole stout, $1\frac{1}{4}$–2 in. long; blade 3–$3\frac{1}{2}$ in. long and broad or larger ?, entire, orbicular in outline, deeply cordate at the base, with an elliptic or elliptic-oblong sinus twice as deep as broad, acutely denticulate on the margin, abruptly and shortly acute at the apex. *Tendrils* bifid, puberulous. *Male flowers* in pedunculate corymbs which elongate into racemes shorter than the leaves; peduncle about 1 in. long, puberulous; pedicels $1\frac{1}{4}$–2 lin. long, puberulous; calyx 5-lobed, pubescent outside; tube $1\frac{1}{4}$ lin. long, broadly campanulate, with a ring of woolly hairs at the mouth inside; lobes $2\frac{1}{2}$–$2\frac{3}{4}$ lin. long, $\frac{1}{3}$–$\frac{1}{2}$ lin. broad at the base, gradually tapering to a slender point, entire; petals free, $2\frac{1}{2}$ lin. long, $1\frac{1}{3}$ lin. broad, ovate, obtuse, pubescent on the back, glandular on the inner face, yellowish-green; stamens inserted at the mouth of the tube; filaments $\frac{3}{4}$ lin. long, 4 of them more or less connate in pairs; anthers 1–$1\frac{1}{4}$ lin. long, curved, free or sometimes connate. *Female flowers* solitary; pedicels 2–3 lin. long, pubescent; ovary $\frac{1}{2}$ in. long, narrowly fusiform, pubescent; calyx and corolla as in the male flowers; stamens rudimentary, without anthers; style about $1\frac{2}{3}$–2 lin. long, the upper part concealed by the reflexed, entire, thimble-shaped stigma. *Fruit* not seen.

Kwebe, *Lugard*, 150.

This differs from *T. Lugardae*, N.E.Br., in its stouter stem and petioles, entire (not at all lobed) leaves with a much narrower basal sinus, bifid tendrils, and larger flowers. According to Lugard the plant is said to be poisonous.

Melothria Marlothii, *Cogn.*
Kwebe Hills, 3,300 ft., *Mrs. Lugard*, 129.
Climbing; flowers white.

Blastania fimbristipula, *Kotsch. & Peyr.*
Kwebe Hills, 3,300 ft., *Mrs. Lugard*, 174.
A creeper; flowers yellowish-cream.

Corallocarpus Welwitschii, *Hook. f.*
Kwebe Hills, 3,300 ft., *Mrs. Lugard*, 37, 132.
Climbing; flowers greenish-yellow; fruit scarlet.

Ficoideae.

Trianthema pentandra, *L.*
Kwebe Hills, 3,300 ft., *Mrs. Lugard*, 97.
Plant spreading; flowers green; fruit maroon-coloured.

Mollugo Bainesii, *Oliv.*
Kwebe Hills, in swampy places, 3,300 ft., *Mrs. Lugard*, 152.
Plant spreading on the ground; flowers greenish-white.

Mollugo hirta, *Thunb.*
Kwebe Hills, in swamps, 3,000 ft., *Mrs. Lugard*, 73.
Plant erect, growing to 6 in. high; flowers green and white.

Mollugo nudicaulis, *Linn.*
Kwebe Hills, in swampy places, 3,300 ft., *Lugard*, 156; *Mrs. Lugard*, 153.
Annual, growing to 8 in. high; flowers greenish-white.

Mollugo Cerviaria, *Ser.*
Kwebe Hills, 3,400 ft., *Mrs. Lugard*, 86.
An erect annual, growing to 3 in. high; flowers white and green.

Giesekia pharnaceoides, *Linn.*
Kwebe, *Lugard*, 102.

Giesekia pentadecandra, *DC.* var?
Kwebe Hills, 3,300 ft., *Lugard*, 101; *Mrs. Lugard*, 141.
An annual growing to 8 in. high, but widely spreading; flowers deep pink; leaves often blotched with pink. This plant seems to be dioecious.

Semonvillea fenestrata, *Fenzl.*
Kwebe Hills, 3,200 ft., *Lugard*, 103; *Mrs. Lugard*, 136.
An erect annual, growing to 15 in. high; flowers white.

Semonvillea sp.?
Kwebe, *Lugard*, 107.
The specimens are too young for their proper identification.

Limeum viscosum, *Fenzl.* var. **longepedunculatum**, *Schinz.*
Kwebe Hills, 3,300 ft., *Lugard*, 100; *Mrs. Lugard*, 93.
An erect annual, growing to 9 in. high; flowers white.

Limeum kwebense, *N. E. Br. Annua*, glabra. *Folia* petiolata, oblonga vel lineari-oblonga, obtusa. *Cymae* pedunculatae, terminales

vel pseudo-axillares, densae. *Sepala* 5, oblonga, mucronato-acuta. *Petala* 5, spathulato-elliptica, obtusa. *Stamina* 7. *Fructus* didymus, rugosus, atratus.

A dwarf *annual* with widely spreading branches, glabrous in all parts. *Leaves* alternate, oblong, oblong-lanceolate or linear-oblong, obtuse, rounded or cuneate at the base; petiole 1½–2 lin. long; blade ½–1½ in. long, 1½–4½ lin. broad. *Cymes* terminal or falsely axillary, pedunculate, densely many-flowered, ½–1 in. in diam. *Peduncles* ¼–1¼ in. long. *Bracts* ¾–1 lin. long, ovate, acuminate, membranous, with a green keel. *Pedicels* ½ lin. long. *Sepals* 5, about 1¼ lin. long, ⅔ lin. broad, oblong, mucronate-acute, concave, membranous, with a narrowly winged green keel. *Petals* 5, about ¾ lin. long, scarcely ½ lin. broad, spathulate-elliptic, obtuse, membranous, white. *Stamens* 7, about ¾ lin. long; filaments dilated at the base, papillate-pilose; anthers yellow. *Ovary* 2-celled; styles 2, short. *Fruit* didymous, rugose, blackish.

Kwebe, chiefly in marshy places, *Lugard*, 186.

Allied to *L. africana*, Burm., but differing in being an annual and in having flowers only about half as large.

Rubiaceae.

Oldenlandia cynanchica, *K. Schum?*

Kwebe Hills, 3,300 ft., *Lugard*, 166; *Mrs. Lugard*, 111.

Plant growing to 15 in. high; flowers white.

Gardenia spatulifolia, *Stapf & Hutch.*

Botletle River, seldom any distance from the river bank, *Lugard*, 7.

A tree, 20 ft. high; flowers cream-coloured, turning to yellow with age.

Vangueria lasioclados, *K. Schum.*

Kwebe Hills, 3,300 ft., *Mrs. Lugard*, 59.

A bush, growing to a height of 6 ft.; flowers green.

Spermacoce deserti, *N. E. Br.* *Caules* acute 4-angulares, angulis scaberulis. *Folia* opposita, sessilia, ligulata vel anguste oblonga, acuta, rigida, utrinque glabra, marginibus scabris; stipulae 5–6-setiferae, glabrae. *Flores* axillares, dense conferti. *Calycis lobi* lanceolati, acuti, scabrido-ciliati. *Corolla* 4-loba, alba; lobi ovato-oblongi, obtusi, dorso parce pubescentes.

Stems subsimple, herbaceous, acutely 4-angled, minutely ciliate-scabrid on the angles, otherwise glabrous; internodes 1–1½ in. long. *Leaves* opposite, sessile, ¾–2 in. long, 2–4 lin. broad, linear-oblong, acute, rather rigid, glabrous on both sides, minutely scabrous on the margins; stipules broad and somewhat membranous, truncate, ciliate with 5–6 bristles 1½–2 lin. long, brownish. *Flowers* numerous, densely crowded in the axils of the leaves, intermingled with numerous short bristles. *Calyx-lobes* 4, erect, 1¾–2 lin. long, ½ lin. broad, slightly larger in fruit, lanceolate, acute, rigid, glabrous on both sides, scabrid-ciliate on the margins. *Corolla* 4-lobed, white; tube 2 lin. long, funnel-shaped, glabrous; lobes spreading, 1½ lin. long, 1 lin. broad, oblong-ovate, obtuse, glabrous with the exception of a few hairs down the middle of the back. *Stamens* inserted in the sinuses between the corolla-lobes, exserted;

filaments $\frac{1}{3}$–$\frac{1}{2}$ lin. long, anthers $\frac{2}{3}$ lin. long. *Ovary* turbinate, compressed, pubescent on the upper part; style exserted, filiform; stigma shortly bifid. *Fruit* about $1\frac{1}{2}$ lin. long, compressed, oblong, pubescent on the upper part.

Kalahari Desert; near Bachakuru, *Lugard*, 233.

Allied to *S. Ruelliae*, DC., but is much more glabrous.

Compositae.

Erlangea misera, *S. Moore.*—*Bothriocline misera*, O. Hoffm.

Botletle Valley, *Lugard*, 209; Kwebe Hills, 3,300 ft., *Mrs. Lugard*, 217.

An erect annual, growing to 2 ft. high; flowers rich purple, or according to Mrs. Lugard's excellent drawing, blue-purple; evidently a handsome plant.

Vernonia fastigiata, *Oliv. & Hiern.*

Kwebe Hills, 3,000 ft., *Mrs. Lugard*, 162; Botletle Valley, *Lugard*, 204.

Plant growing to 2 ft. high; flowers purple.

Vernonia vitellina, *N. E. Br.*—*Gongrothamnus divaricatus*, Steetz in Peters, Reise Mossamb. Bot. p. 342; Hook. Ic. Pl. xii. t. 1140; Oliv. in Fl. Trop. Afr. iii., p. 401.

Okavango Valley, 3,000 ft., *Lugard*, 251; and also on the Kwebe Hills according to *Lugard*. Nyasaland: Zomba, *Sharpe*, 197. Portuguese East Africa: Lower valley of the River Shire, *Kirk*, and near Inhambane, *Peters*.

A luxuriant creeper with orange flowers.

I refer *Gongrothamnus* to *Vernonia* as I can find no structural characters whatever to distinguish them generically. The characters mentioned by Steetz and by Bentham do not hold good, for the style-branches are just the same as in those species of *Vernonia* in which the style-branches are flattened. The pubescence on their backs, however, although distinct, is more minute in *V. vitellina* than usual, whilst in *V. angolensis* (*Antunesia angolensis*, O. Hoffm.) it is quite as evident and as long as in many species recognised as belonging to *Vernonia*. There remains then only the colour of the flowers to separate these two genera. Hoffmann in *Engler & Prantl, Pflanzenfam.* iv. pt. 5, p. 126 has likewise united *Gongrothamnus* with *Vernonia*, but in *Engler Jahrbuch*, xxx. p. 433, (as noted in *Engler & Prantl, Pflanzenfam. Nachträge*, iii. zu iv. 4, p. 337) he has again separated *Gongrothamnus*, entirely on account of the flowers being yellow instead of red, white or blue. As I can find no distinction except colour I here refer all the species of *Gongrothamnus* to *Vernonia*, including also the genus *Antunesia*, which, as Hoffmann admits in Engler's *Jahrbuch* above quoted, is not generically separable. Therefore:—

Antunesia angolensis, O. Hoffm. =
Vernonia angolensis, *N. E. Br.*

Gongrothamnus angolensis, Hiern =
Vernonia lutea, *N. E. Br.*

" *aurantiacus*, O. Hoffm. =
Vernonia aurantiaca, *N. E. Br.*

Gongrothamnus conyzoides, Hiern =
Vernonia crassipetala, *N. E. Br.*

" *Hildebrandtii*, Oliv. & Hiern =
Vernonia Hildebrandtii, *Vatke.*

" *solidaginifolius*, Oliv. & Hiern =
Vernonia solidaginifolia, *Boj.*

" *divaricatus*, Steetz =
Vernonia vitellina, *N. E. Br.*

Some of the specific names are changed because they are already used under *Vernonia.*

Vernonia senegalensis, *Less.*
Okavango Valley, about 3,000 ft., *Lugard*, 249 ; Botletle Valley, ex *Lugard.*
A bush, growing to 15 ft. high ; flowers cream-coloured, sweetly scented.

Vernonia ondongensis, *Klatt.*
Botletle River, 3,000 ft., *Mrs. Lugard*, 8 ; Okavango Valley, about 3,000 ft., *Lugard*, 250.
An annual, 5–6 ft. high ; flowers blue.

* **Nicolasia Lugardi**, *N. E. Br.* in Bull. Herb. Boiss. sér. 2, iv. p. 1015.
Okavango Valley, about 3,000 ft., growing in sand, *Lugard*, 252.

Nidorella resedifolia, *DC.* Two forms.
Botletle Valley, *Lugard*, 201 ; Kwebe Hills, 3,300 ft., *Mrs. Lugard*, 90.
Erect, growing to 3 ft. high ; flowers bright yellow.

Pluchea Leubnitziae, *N. E. Br.*—*Piptocarpha Leubnitziae*, O. Kuntze in Jahrb. Bot. Gart. Berl. iv. p. 265. *Pechuelloeschea Leubnitziae*, O. Hoffm. in Engler Jahrb. x. p. 274.
Bechuanaland : Keria, *Lugard*, 1A ; South Tropical Africa, *Baines.*
Hoffmann separates this plant generically from *Pluchea* on account of its habit, involucre, and 1-seriate female flowers. But the habit is scarcely distinct from that of some Indian and Australian species of *Pluchea*, whilst several species have quite the same kind of involucre, and the number of series of female florets varies.

Helichrysum argyrosphaerum, *DC.*
Okavango Valley, 3,000 ft., *Lugard*, 255.
Plant spreading, growing to 8 in. high ; flower-heads pink and white.

Helichrysum ericaefolium, *Less.* var.
Okavango Valley, 3,000 ft., *Lugard*, 254.
A sand-plant ; flowers white.

Helichrysum subglomeratum, *Less.*
Okavango Valley, 3,000 ft., *Lugard*, 253.
Plant growing to 3 ft. high ; flowers yellow.

Calostephane divaricata, *Benth.*
Kwebe, *Lugard*, 126 ; Kwebe Hills, 3,000 ft., *Mrs. Lugard*, 205.
An annual, from a few inches to 4 ft. high ; flowers yellow.

Philyrophyllum Schinzii, *O. Hoffm.*
Okavango Valley, 3,000 ft., *Lugard*, 257.
A bushy plant, growing to 6 ft. high ; flowers yellow.

Geigeria Schinzii, *O. Hoffm.*
Okavango Valley ? *Lugard*, 256.

Eclipta alba, *Hassk.*
Botletle Valley, in marshy places, *Lugard*, 211.
Flowers dirty white.

Melanthera varians, *Hiern.*
Botletle Valley, *Lugard*, 195.
Plant 3–4 ft. high ; flowers bright yellow.

Bidens Schimperi, *Sch. Bip.* var.
Kwebe, *Lugard*, 177 ; Kwebe Hills, 3,300 ft., *Mrs. Lugard*, 177.
An erect annual, 3–4 ft. high ; flowers bright yellow.

Senecio Schinzii, *O. Hoffm.*
North Kalahari Desert ; near T'Klakane Pits, about 3,000 ft., *Lugard*, 228, and near Inkonane Pits, *Lugard*, 293.
An erect annual, growing to 2 ft. high ; flowers pink.
This species appears to be dioecious or sub-dioecious, as on some specimens the flower-heads have involucres only 2–2½ lin. long and 1½ lin. in diam., and the achenes do not appear to be fertile ; on other specimens the flower-heads have involucres 3–5 lin. long and 2½–3 lin. in diam., with fertile achenes.

Senecio longiflorus, *Oliv. & Hiern.*
Near Botletle, *Lugard*, 6 ; Kwebe, *Lugard*.
Grows among dry bush, usually 2–3 ft., sometimes 6 ft. high ; flowers yellow.

Berkheya gorterioides, *Oliv. & Hiern.*
Kwebe, *Lugard*, 97 ; Kwebe Hills, 3,400 ft., *Mrs. Lugard*, 110.
An annual, 4–15 in. high ; flowers yellow.

Dicoma Schinzii, *O. Hoffm.*
Near Chukutsa Salt-pan in the northern Kalahari Desert, *Lugard*, 222 ; Kwebe Hills, 3,300 ft., rare, *Mrs. Lugard*, 163.
Plant growing to 9 in. high ; flowers dirty white.

Dicoma tomentosa, *Cass.*
Kwebe Hills, 3,300 ft., *Mrs. Lugard*, 216.
An erect annual, growing to 3 ft. high ; flowers green.

Dicoma anomala, *Sond.*
Near Inkonane Pits, in the northern Kalahari Desert, about 3,000 ft., *Lugard*, 294.
Plant growing to 1 ft. high ; flowers greyish-white.

Campanulaceae.

Wahlenbergia okavangensis, *N. E. Br.* *Herba* perennis, 7·5–25·4 cm. alta, basi ramosa. *Rami* erecti, graciles, superne laxe corymboso-ramosi, glabri. *Folia* erecta, 2–8 mm. longa, linearia vel subulata, acuta, minute calloso-denticulata, glabra vel pubescentia. *Calycis lobi* 2–2·7 mm. longi, subulati. *Ovarium* hemisphaericum, puberulum. *Corolla* 5–7 mm. longa, coerulea. *Capsula* trivalvis.

A small *perennial herb* 3–10 in. high, branching at the base. *Stems* erect, slender, loosely branching at the top into a corymbose inflorescence, glabrous or with a minute retrorse pubescence on the apical part. *Leaves* alternate, erect, scattered all along the stems and here and there collected in small dense rosettes, 1–4 lin. long, $\frac{1}{4}$–$\frac{1}{2}$ lin. broad, linear or subulate, acute, with thickened, minutely denticulate margins, glabrous or pubescent. *Pedicels* $1\frac{1}{2}$–5 lin. long, glabrous or retrorsely puberulous. *Calyx* 5-lobed; lobes 1–$1\frac{1}{3}$ lin. long, subulate, ascending, glabrous, minutely denticulate; ovary about $\frac{1}{2}$ lin. long, hemispherical, retrorsely puberulous. *Corolla* campanulate, blue, glabrous; tube 2–$2\frac{3}{4}$ lin. long; lobes 1–$1\frac{1}{2}$ lin. long, deltoid, acute. *Capsule* about $1\frac{1}{4}$ lin. long, half-superior, 3-valved.

Okavango Valley, about 3,000 ft., a sand plant, *Lugard*, 258.

Allied to *W. Ecklonii*, Buek, but less leafy and with much shorter calyx-lobes.

Plumbagineae.

Plumbago zeylanica, *Linn.*

Banks of the Botletle River at Matabele Drift, *Lugard*, 5; Okavango Valley, about 3,000 ft., *Lugard*, 259.

Flowers white.

Ebenaceae.

Royena pallens, *Thunb.*

Lake River, *Lugard*, 19; Hackthorn Vley in the northern Kalahari Desert, about 3,000 ft., *Lugard*, 298.

A shrub, 8–10 ft. high; flowers primrose-yellow, sweetly scented.

Oleaceae.

Jasminum mauritianum, *Boj.*

Okavango Valley, about 3,000 ft., *Lugard*, 230.

A creeper-bush; flowers white, very sweetly scented.

Apocynaceae.

Adenium Lugardi, *N. E. Br.* *Planta* 15–20 cm. alta, minute pubescens. *Folia* erecta, longe lineari-oblonga, obtusa, apiculata, basi in petiolum brevem angustata. *Cymae* 2–4-florae, ubique dense pubescentes. *Pedunculi* et pedicelli breves. *Sepala* lanceolata, acuminata. *Corolla* rosea; tubus 3–3·3 cm. longus, basi anguste cylindricus, superne infundibuliformi-ampliatus, extra pubescens, intra ad medium tantum pubescens; lobi elliptici, acuti. *Antherae* dorso pubescentes, appendiculis linearibus contortis pubescentibus longe exsertis. *Ovarium* cum stylo glabrum.

A dwarf species 6–8 in. high. *Branches* with a minute spreading pubescence. *Leaves* erect, 2–4 in. long, 4–10 lin. broad, linear-oblong, obtuse, minutely apiculate, tapering at the base into a petiole 2–4 lin. long, more or less longitudinally folded, softly pubescent on both sides, but more densely beneath. *Cymes* appearing with the leaves, axillary and terminal, 2–4-flowered, densely white-pubescent from peduncle to calyx. *Peduncles* 1–$3\frac{1}{2}$ lin. long. *Bracts* 3–4 lin. long, subulate or lanceolate-subulate.

Pedicels 1–2½ lin. long. Sepals 4 lin. long, 1½ lin. broad, lanceolate, acuminate. *Corolla* "pink, very waxy" (*Lugard*) ; tube 1¼–1⅓ in. long, pubescent outside and at the middle part within where the filaments of the stamens are decurrent, the base inside is quite glabrous, and the upper, funnel-shaped part is minutely papillate, but can scarcely be called puberulous ; lobes 8–9 lin. long, ½ in. broad, elliptic-ovate, acute, glabrous within, puberulous on one half on the back. *Filaments* of the stamens 1¼–1⅓ lin. long, densely pubescent ; anthers about 3 lin. long, pubescent on the back, their appendages ½ in. long, much exserted, linear, pubescent, all twisted together.

Bechuanaland ; Palapye, 3,000 ft., *Lugard*, 269.

A distinct species, well characterised by its dwarf habit and erect strap-shaped leaves.

Carissa tomentosa, *A. Rich.*

Lake River, *Lugard*, 16.

A creeper-like tree, 20 ft. high ; flowers pinkish-white.

Asclepiadaceae.

***Raphionacme lanceolata**, *Schinz*, var. **latifolia**, *N. E. Br.* in Fl. Trop. Afr. iv., 1, p. 274.

Kwebe Hills, 3,200 ft., *Lugard*, 69, 98 ; *Mrs. Lugard*, 71 ; northern Kalahari Desert, near Chukutsa Salt-pan, 3,000 ft., *Lugard*, 260.

The stems apparently spring up from a succulent root, growing to 2 or 3 ft. high ; flowers greenish or grey-green, or mauve and green.

***Schizoglossum aciculare**, *N. E. Br.* in Fl. Trop. Afr. iv., 1, p. 363.

Near Kwebe, *Lugard*, 82.

***Asclepias rostrata**, *N. E. Br.* in Fl. Trop. Afr. iv., 1, p. 331.

Lake Ngami, *Lugard*, 22 ; Okavango Valley, about 3,000 ft., *Lugard*, 231.

A bush, 3–5 ft. high ; flowers creamy-white, with light green corona. It grows only on the dry shore of the lake or river.

Pachycarpus concolor, *E. Mey.*

Bechuanaland ; near Palapye, 3,000 ft., *Lugard*, 261.

Plant about 1 ft. high, erect : flowers green and brown.

Pentarrhinum insipidum, *E. Mey.*

Grassy plains near Botletle River, *Lugard*, 217.

Flowers chocolate and green.

Sarcostemma viminale, *R. Br.*

Kwebe Hills, 3,300 ft., *Mrs. Lugard*, 185.

A creeper, climbing to a height of 20 ft. ; corolla green, corona white ; fruit brown, spotted with green.

Pergularia extensa, *N. E. Br.* (*Doemia extensa*, R. Br.) : *vide* Kew Bulletin, 1907, 323.

Botletle Valley, *Lugard*, 200 ; Kwebe Hills, 3,300 ft., *Mrs. Lugard*, 202.

A very succulent and milky creeper ; corolla light green, corona white.

Marsdenia zambesiaca, *Schlechter.*
Kwebe, *Lugard*, 60 ; Kwebe Hills, 3,000–3,500 ft., *Mrs. Lugard*, 17.
A creeper, with a very milky stem ; flowers green, according to Lugard, creamy white according to Mrs. Lugard.

***Fockea Lugardi**, *N. E. Br.* in Fl. Trop. Afr. iv., 1, p. 429.
Kwebe Hills, 3,000 ft., *Lugard*, 299.
Creeping over rocks ; flowers green.

Orthanthera jasminiflora, *N. E. Br.*
Lake Ngami, *Lugard*, 23.
Creeps on sandy soil, with trailers 6 ft. long ; flowers cream-coloured, strong-scented.

***Ceropegia Lugardae**, *N. E. Br.* in. Fl. Trop. Afr. iv., 1, p. 455.
Kwebe Hills, 3,000 ft., *Mrs. Lugard*, 262.
Flowers green, spotted with purple-brown outside.

***Ceropegia kwebensis**, *N. E. Br.* in Fl. Trop. Afr. iv., 1, p. 456.
Kwebe Hills, 3,400 ft., apparently rare, *Mrs. Lugard*, 116.
Creeping on rocks ; corolla green outside, with purplish hairs on the lobes.

***Ceropegia floribunda**, *N. E. Br.* in Fl. Trop. Afr. iv., 1, p. 460.
Kwebe Hills, 3,000 ft., very rare, *Mrs. Lugard*, 161.
A creeper ; corolla green tinted with purplish at the base.

***Caralluma atrosanguinea**, *N. E. Br.* in Fl. Trop. Afr. iv., 1, p. 485.
Northern Kalahari Desert, *Lugard*, 263.
Flowers mauve according to Lugard, but a plant grown from a half-dried portion of Lugard's specimen produced flowers of an intense blackish-crimson.

***Caralluma lateritia**, *N. E. Br.* in Fl. Trop. Afr. iv., 1, p. 486.
Botletle flats, near Tame's and Rakop's Villages, about 3,000 ft. *Lugard*, 307.
Grows to 9 inches high ; flowers brick-red.

***Caralluma Lugardi**, *N. E. Br.* in Fl. Trop. Afr. iv., 1, p. 487.
Totin, near Lake Ngami, *Lugard*, 74.
Flowers bright chocolate.

***Caralluma maculata**, *N. E. Br.* in Fl. Trop. Afr. iv., 1, p. 487.
Near T'Klakane Pits, in the northern Kalahari Desert, about 3,000 ft., *Lugard*, 297.
Grows 3–4 inches high ; flowers green, spotted with dark claret.

***Hoodia Lugardi**, *N. E. Br.* in Fl. Trop. Afr. iv., 1, p. 491.
Chukutsa Salt-pan, northern Kalahari Desert, *Lugard*, 303.
Plant growing to 2½ ft. high, erect, thorny ; flowers brick-red.

***Stapelia kwebensis**, *N. E. Br.* in Fl. Trop. Afr. iv., 1, p. 501.
Kwebe Hills, 3,200 ft. *Lugard*, 112 ; *Mrs. Lugard* 29.
Flowers varying from maroon to ochre.

Gentianaceae.

Enicostemma littorale, *Bl.*
Near Backakuri, in the Kalahari Desert, *Lugard*, 235 ; Kwebe Hills, 3,000 ft., apparently rare, *Lugard*, 87 ; *Mrs. Lugard*, 199.
Plant growing to 6 in. high ; flowers white or orange.

Boragineae.

Ehretia mossambicensis, *Klotzsch.*
Kwebe Hills, 3,400 ft., *Lugard*, 36, 37 ; *Mrs. Lugard*, 48.
A shrub, 3–12 ft. high ; flowers bluish-white, lilac, or mauve.

Heliotropium ovalifolium, *Forsk.*
Lake River, *Lugard*, 193 ; Kwebe Hills, 3,300 ft., *Lugard*, 76 ; *Mrs. Lugard*, 151.
This plant grows only in swampy places, and attains a height of about 13 in. ; foliage silvery-green ; flowers white.

Heliotropium strigosum, *Willd.*
Kwebe, *Lugard*, 149.
Flowers white.

***Heliotropium dissimile**, *N. E. Br.* in Fl. Trop. Afr. iv., 2, p. 42.
Kwebe Hills, 3,400 ft. In dry sandy places, *Lugard*, 139 ; *Mrs. Lugard*, 77.

Convolvulaceae.

Ipomoea angustifolia, *Jacq.*
Botletle Valley, *Lugard*, 207 ; Kwebe Hills, 3,300 ft., *Mrs. Lugard*, 133.
Creeping on the ground ; flowers yellow.

Ipomoea adenoides, *Schinz.*
Near Chukutsa Salt-pan in the Northern Kalahari Desert, *Lugard*, 224 ; near Palapye, *Lugard*, 265.

Ipomoea chloroneura, *Hallier f.*
Botletle Valley, *Lugard*, 190.
Flowers white.

Ipomoea cardiosepala, *Hochst.*
Kwebe Hills, 3,000 ft., *Lugard*, 125 ; *Mrs. Lugard*, 159. Kobis to North Shaw Valley, *Baines.*
A ground-creeper ; flowers white, with a radiating purple centre

Ipomoea ochracea, *G. Don* var.
Kwebe Hills, 3,400 ft., *Mrs. Lugard*, 114.
A creeper ; flowers creamy-yellow or ochreous.

Ipomoea lilacina, *Bl.* (*I. Lindleyi*, Choisy).
Without precise locality, *Lugard*, 300.

Ipomoea pilosa, *Sweet.*
Kwebe Hills, 3,300 ft., *Mrs. Lugard*, 223.
A creeper, with milky sap ; flowers deep mauve.

Ipomoea Bolusiana, *Schinz* (*Ipomoea angustisecta*, Engl.).

Near T'Klakane Pits, in the Northern Kalahari Desert, *Lugard*, 225 ; Botletle Valley, *Lugard*, 264.

Creeping on the ground ; flowers purple-pink.

Ipomoea Magnusiana, *Schinz.*

Kwebe, very common, *Lugard*, 119 ; Kwebe Hills, 3,400 ft., *Mrs. Lugard*, 135.

Creeping on the ground ; flowers white.

Ipomoea kwebensis, *N. E. Br. Caulis* longissime volubilis, glaber. *Folia* petiolata, ad basin palmatisecta, 5–7-loba, glabra, lobis lanceolatis acutis. *Pedunculi* breves, 1–3-flori, glabri. *Sepala* ovata, acuta, dorso scabrido-tuberculata. *Corolla* 18–20 mm. longa, roseo-purpurea, glabra. *Semina* dense velutino-pubescentia. *I. quinquefolia*, var. *purpurea*, Hallier f. in Bull. Herb. Boiss, vi. 546.

Glabrous in all parts, with the exception of the seeds. *Stem* rather slender, very long, twining. *Leaves* palmately divided to the base into 5–7 lobes ; when 7-lobed, the two basal lobes are much smaller than the rest and adnate to the adjacent lobe for a quarter to a third of their length, all lanceolate, acute, tapering below to an acute base, the larger 1½–2 in. long, 6–8 lin. broad ; petioles ¾–1¼ in. long, nearly or quite without tubercle-like glands. *Peduncles* ¼–½ in. long, 1–3-flowered. *Bracts* ½–¾ lin. long, subulate. *Pedicels* 4–6 lin. long. *Sepals* 2½–3 lin. long, 1–1⅓ lin. broad, ovate, acute, tuberculate on the back. *Corolla* 9–10 lin. long, about 1 in. in expanse, deep mauve. *Capsule* 3½ lin. long, 3 lin. in diam. *Seeds* densely velvety-pubescent.

Kwebe Hills, 3,300 ft., *Mrs. Lugard*, 218.

Although this plant is exceedingly like *I. quinquefolia*, Hochst., in foliage and flower, it is so entirely different in habit, being in all probability a perennial, with very long twining stems, nearly or quite glandless petioles and purple flowers, besides coming from quite a different geographical area, that I cannot follow Hallier in considering it to be a variety of *I. quinquefolia*, Hochst. The latter is an annual, with short prostrate stems that show no tendency to twine, gland-tuberculate petioles, white flowers, and has hitherto only been found in Abyssinia. *I. quinquefolia*, var. *pubescens*, of the Flora Capensis is entirely different in foliage and calyx from the Abyssinian plant as well as from *I. kwebensis*.

Ipomoea verecunda, *N. E. Br. Caulis* prostratus, tenuiter puberulus. *Folia* petiolata, palmatim 7–9-loba, supra glabra, subtus parce pubescentia ; lobi lineari-oblongi, anguste oblongo-lanceolati vel obovato-spathulati, acuti vel obtusi, apiculati, basi angustati. *Pedunculi* 1-flori, prope apicem bibracteolati. *Sepala* late ovata, obtusa vel subacuta, pubescentia, atropurpureo-nervosa. *Corolla* quam calyx paullo longior, 1·8 cm. diametro, alba, tubo brunneo-purpureo, glabro. *Merremia verecunda*, Rendle in Fl. Trop. Afr. iv., 2, p. 110.

Stems procumbent, rather slender, very thinly puberulous. *Leaves* petiolate, 1¼–2½ in. in diam., deeply palmately 7–9-lobed, glabrous above, thinly pubescent beneath and on the ½–1 in. long petioles ; lobes 8–15 lin. long, 2–5 lin. broad, linear-oblong, narrowly oblong-lanceolate or spathulate-obovate, acute or obtuse, apiculate, tapering at the base into the very short portion of the leaf

by which they are connected, apparently more or less folded lengthwise. *Peduncles* 1½–2¾ in. long, one-flowered, bibracteolate ⅓–⅔ in. below the calyx, thinly pubescent below the bracteoles, rather densely so above them. *Bracteoles* 3–4 lin. long, linear or linear-lanceolate, acute, thinly pubescent. *Sepals* 4–4½ lin. long, about 3 lin. broad, ovate, obtuse or subacute, softly pubescent, pale green, with six to seven purple-brown nerves. *Corolla* about one-third longer than the calyx, 5–6 lin. long, about ¾ in. in diam., glabrous, white, with a purple-brown or chocolate-coloured centre. *Stigmas* didymous, with globose lobes. *Seeds* 2 lin. in diam., blackish, smooth, glabrous, ciliate on the angles with minute flattened hairs.

Kwebe Hills, 3,400 ft., comparatively rare, *Mrs. Lugard*, 134; northern Kalahari Desert, near T'Klakane Pits, *Lugard*, 227.

Allied to *I. Magnusiana*, Schinz, differing in having the leaves green (not white) beneath, and in the broader-veined sepals.

According to Mrs. Lugard's note on the label, the corolla frequently does not expand fully. The calyx is not unlike that of *Hibiscus Trionum*, Linn., in miniature.

***Ipomoea Lugardi**, *N. E. Br.* in Fl. Trop. Afr. iv., 2, p. 163.

Kwebe Hills, 3,300 ft., *Mrs. Lugard*, 211; Bechuanaland: Eastern Bamanguato Country; between Henry's Vley and Tamasetze, *Holub*, 1062; northern Kalahari Desert, near T'Klakane Pits, *Lugard*, 226.

Ipomoea kentrocaulos, *Clarke* var. **pinnatifida**, *N. E. Br. Folia* 7-lobata, lobis pinnatifidis. *Pedunculi* 1–2-flori. *Bracteae* saepe foliosae, sessiles vel petiolatae, lobatae, lobis pinnatifidis. *Merremia kentrocaulos*, Rendle, var. *pinnatifida*, Rendle in Fl. Trop. Afr. iv., pt. 2, p. 103.

Plant *perennial*, trailing, similar to the typical form, differing in having the lobes of the leaves deeply pinnatifid and the bracts often (always ?) more or less like the leaves, being divided and pinnatifidly lobed in the same way, petiolate or sessile, but smaller. *Flowers* creamy-white, brownish-crimson in the tube.

Kwebe Hills, 3,300 ft., *Mrs. Lugard*, 82.

Dr. Rendle has attributed the authority of this variety under *Merremia* to myself, but I do not recognise *Merremia* as distinct from *Ipomoea*.

Ipomoea dissecta, *Willd.*

Kwebe Hills, 3,300 ft., *Mrs. Lugard*, 140.

Creeping on the ground; flowers white.

***Ipomoea calcarata**, *N. E. Br.* in Fl. Trop. Afr. iv., 2, p. 180.

Kwebe Hills, 3,300 ft., *Lugard*, 182; *Mrs. Lugard*, 208.

This very distinct species is nearly allied to *I. odontosepala*, Baker, but has flowers only half the length and half the diameter of those of that species. According to Mrs. Lugard, the "flower opens with sunrise and rapidly closes."

Ipomoea pinnata, *Hochst.*

Kwebe Hills, only found among rocks, comparatively rare, 3,300 ft., *Lugard*, 248; *Mrs. Lugard*, 176.

Trailing; flowers bright yellow.

Astrochloena lachnosperma, *Hallier f.*

Kwebe Hills, 3,300 ft., *Mrs. Lugard*, 91.

An erect annual, 1–1½ ft. high ; flowers white, with a magenta centre.

***Jacquemontia capitata**, *G. Don* var. **pauciflora**, *N. E. Br.* in Fl. Trop. Afr. iv., 2, p. 86.

Very common at Kwebe, scarcely any in Botletle Valley, *Lugard*, 183 ; Kwebe Hills, 3,300 ft., *Mrs. Lugard*, 169.

Convolvulus sagittatus, *Thunb.* var.

Near Kwebe, *Lugard*, 77.

Flowers white.

Evolvulus alsinoides, *Linn.*

Kwebe Hills, 3,400 ft., *Lugard*, 141 ; *Mrs. Lugard*, 99.

Annual, growing to 8 in. high ; flowers bright blue.

Breweria suffruticosa, *Schinz* (*Seddera suffruticosa*, Hallier f.).

Kwebe Hills, 3,000 ft., *Lugard*, 184 ; *Mrs. Lugard*, 203.

Plant spreading on the ground ; flowers white.

There appears to me no valid reason for distinguishing *Seddera* from *Breweria*.

Solanaceae.

Solanum incanum, *Linn.*

Kwebe Hills, 3,300 ft., *Mrs. Lugard*, 18.

A thorny perennial, almost evergreen ; flowers mauve ; fruit globose, 1¼–1½ in. in diam., yellow.

Solanum panduraeforme, *E. Mey.*

Kwebe Hills, 3,300 ft., *Lugard*, 55 ; *Mrs. Lugard*, 19.

A thornless perennial, sheds its leaves readily ; flowers purple-mauve ; fruit globose, ¾–1 in. in diam., yellow.

***Solanum kwebense**, *N. E. Br.* in Fl. Trop. Afr. iv., 2, p. 225.

Kwebe Hills, 3,300 ft., *Lugard*, 50 ; *Mrs. Lugard*, 62.

Scrophulariaceae.

Aptosimum lineare, *Marl. & Engl.*

Near T'Klakane Pits in the northern Kalahari Desert, *Lugard*, 230.

Flowers deep purple-blue.

Aptosimum decumbens, *Schinz.*

Okavango Valley, about 3,000 ft., *Lugard*, 266.

Creeping on the ground ; flowers purple.

***Peliostomum Lugardae**, *N. E. Br.* in Fl. Trop. Afr. iv., 2, p. 275.

Kwebe Hills, 3,400 ft., *Mrs. Lugard*, 124.

Lyperia atropurpurea, *Benth.*

Botletle Valley, *Lugard*, 267.

Lyperia canescens, *Benth.*

Botletle Valley, *Lugard*, 268.

Alectra parvifolia, *Schinz.*

Kwebe, *Lugard*, 171 ; near Makarukaru Valley, 33 miles south-east of Kwebe, 3,300 ft., *Mrs. Lugard*, 186.

Flowers orange-yellow, veined with russet-brown.

Alectra Vogelii, *Benth.* var.
Botletle Valley, *Lugard*, 210.
Flowers bright yellow.

Striga orobanchoides, *Benth.*?
Kwebe Hills, 3,300 ft., *Lugard*, 127 ; *Mrs. Lugard*, 164.
Grows on the roots of small annuals. The plant turns black if bruised. The flowers vary in colour from pure white to mauve and dark purple.

Striga Thunbergii, *Benth.*
Okavango Valley, about 3,000 ft., *Lugard*, 270.
Found in inundated places ; flowers purple.

Rhamphicarpa tubulosa, *Benth.*
Bank of Botletle River at Matabele Drift, *Lugard*, 4 ; Okavango Valley, about 3,000 ft., *Lugard*, 271.
On inundated or damp ground, erect, growing to 2 ft. high ; flowers bright pink.

Sopubia Dregeana, *Benth.*
Okavango Valley, about 3,000 ft., *Lugard*, 272.
On inundated ground, growing to 2 ft. high ; flowers mauve.

Bignoniaceae.

Markhamia acuminata, *K. Schum.*
Kwebe Hills, 3,200–3,500 ft., *Lugard*, 58 ; *Mrs. Lugard*, 55.
A tree 10–20 ft. high, never seems to attain more than a few inches in girth ; the flowers vary from russet to maroon—according to Mrs. Lugard's drawing they are dark brownish-crimson on the lobes, and whitish, spotted with purple-brown in the tube ; fruit a long brown pod.

Rhigozum brevispinosum, *O. Kuntze.*
Kwebe Hills, 3,400 ft., *Lugard*, 35 ; *Mrs. Lugard*, 46.
A thorny shrub, 4–8 ft. high ; flowers bright yellow.

Catophractes Alexandri, *Don.*
Kwebe Hills, 3,000 ft., *Lugard*, 65 ; *Mrs. Lugard*, 83.
A shrub, 5–6 ft. high ; foliage whitish ; flowers pure white ; fruit silvery-green.

Kigelia pinnata, *DC.* var. **tomentella**, *Sprague.*
Okavango Valley, at Bakalahari Village, about 3,000 ft., *Lugard*, 233.
A tree, growing to 30 ft. high ; flowers rich claret-coloured, with yellowish stamens ; fruit the shape of a "Bologna sausage" attaining sometimes a length of 3 ft., brown, hanging from a rope-like stalk generally longer than the fruit.

Pedalineae.

* **Pterodiscus ngamicus**, *N. E. Br.* in Fl. Trop. Afr. iv., 2, p. 543.
Kwebe Hills, 3,000 ft., *Lugard*, 136A.
Allied to *P. luridus*, Hook. f., but has very much larger fruit. According to a note made by Mrs. Lugard upon her drawing of

the plant, the rootstock produces a very "glutinous transparent exudation, through the incision of new growth."

Harpagophytum procumbens, *DC.*

Botletle Valley, *Lugard*, 212; Kalahari Desert; Kwebe to Palapye, 3,000 ft., *Lugard*, 273.

Creeping on the ground; flowers deep purple or magenta, white at the base.

Holubia saccata, *Oliv.*

Near Mamunwe in the Kalahari Desert, *Lugard*, 240.

Flowers greenish-yellow.

***Sesamothamnus Lugardi**, *N. E. Br.* in Fl. Trop. Afr. iv., 2, p. 568.

Northern Kalahari desert, near Chukutsa Salt-pan, 3,000 ft. *Lugard*, 274. South-west Africa, without precise locality, at latitude 23°, *Chapman & Baines.*

Sesamum grandiflorum, *Schinz.*

Kwebe Hills, 3,300 ft., *Lugard*, 111; *Mrs. Lugard*, 172.

An erect annual, growing to 5 ft. high; flowers white, light lilac or dull mauve in various shades, with the inside of the tube dark mauve-purple. Said to be a remedy for snake bites; the leaves rubbed on the affected part are said to draw out the pain and produce a blister. The native name is 'Dhobi.'

Sesamum alatum, *Thonn.*

Botletle Valley, *Lugard*, 188.

"Flowers lake-colour ?"

Ceratotheca triloba, *E. Mey.*

Mamunwe, in the Kalahari Desert, *Lugard*, 241.

Flowers purplish-white.

Pretrea eriocarpa, *Decne.*

Botletle Valley, *Lugard*, 208, 275.

Creeping on the ground; flowers light purple.

Acanthaceae.

Thunbergia aurea, *N. E. Br.* *Annua*, erecta vel scandens, pubescens. *Folia* alato-petiolata, deltoideo-ovata, acuta, dentata, basi subtruncata, acuto-angulata. *Pedunculi* 2·5–5 cm. longi. *Bracteae* elongato-ovatae, acutae, integrae, basi cordatae. *Calycis dentes* subulati. *Corolla* omnino aurantiaca, 1·6–1·8 cm. diam.; tubus 14–18 mm. longus, anguste infundibuliformis.

Annual. *Stem* at first erect, becoming twining, growing to 2 ft. in height, pubescent with long and short spreading hairs. *Leaves* somewhat spreading, thin, herbaceous, pubescent; petiole 1–2 in. long, winged, 1–2 lin. broad; blade $1\frac{1}{2}$–$3\frac{1}{2}$ in. long, 1–$2\frac{1}{2}$ in. broad, deltoid-ovate, acute, toothed on the margins, truncate or subhastate at the base, with acute outer angles, 5-nerved. *Peduncles* solitary, from both axils, 1–2 in. long, pubescent. *Bracts* $\frac{3}{4}$ in. long, 4–5 lin. broad, rather larger when in fruit, ovate, acute, cordate at the base, shortly wing-keeled at the base on the back, pubescent. *Calyx-teeth* several, 1–$1\frac{1}{2}$ lin. long, subulate, pubescent. *Corolla* entirely (tube and limb) orange-yellow, glabrous outside, bearded at the

insertion of the stamens and minutely pubescent in the throat and around the mouth of the tube within; tube 7–9 lin. long, tubular-infundifuliform, about $2\frac{1}{2}$ lin. in diam. at the top; limb speading, 8-9 lin. in diam.; lobes subequal, $3\frac{1}{2}$–4 lin. long and broad, very obtuse or slightly emarginate. *Stamens* included, about 3 lin. long; filaments glabrous; anther-cells subequal, both of them spurred and bearded at the base only. *Style* as long as the stamens, filiform, glabrous; stigma unequally 2-lobed; lobes with incurved sides, so that each of them is somewhat obliquely funnel-shaped.

Kwebe Hills, 3,400 ft. *Lugard*, 114; *Mrs. Lugard*, 107.

Allied to *T. alata*, Boj., but differs in having much smaller flowers, which are entirely orange-yellow, not purple in the tube. The anthers are bearded at the base only, not to $\frac{2}{3}$ of the way up as they are in *T. alata*, and the hairs are different.

Ruellia prostrata, *T. And.*

Kwebe Hills, 3,300 ft., *Mrs. Lugard*, 89.

A perennial, growing to 2 ft. high; flowers mauve.

Ruellia patula, *Jacq.* (*fide* C. B. Clarke).

Kwebe Hills, 3300 ft., *Lugard*, 45, 49, 68; *Mrs. Lugard*, 63.

A dwarf perennial, 6–12 in. high; flowers white (Nos. 45 and 63), or purple (Nos. 49 and 68).

***Ruelliopsis setosa**, *C. B. Clarke* in Fl. Trop. Afr. v., p. 59.

Northern Kalahari Desert near Chukutsa Salt-pan, *Lugard*, 220; near T'Klakane Pits, *Lugard*, 245.

Flowers light purple.

Petalidium latifolium, *C. B. Clarke.*

Kwebe, *Lugard*, 121; plains near Kwebe Hills, 3,000 ft., *Mrs. Lugard*, 12.

Perennial, 2–3 ft. high, with soft silvery foliage; upper four lobes of the corolla brick-red, lower lobe yellow, according to Mrs. Lugard's drawing.

Blepharis diversispina, *C. B. Clarke.*

Near Chanokha, by the Botletle River and also on the Kwebe Hills, 3,000–3,300 ft., *Mrs. Lugard*, 6.

Perennial; flowers blue.

Blepharis serrulata, *Ficalho & Hiern.*

Kwebe, *Lugard*, 85.

Barleria macrostegia, *Nees.*

Near Inkonane Pits in the northern Kalahari Desert, about 3,000 ft., *Lugard*, 295.

Grows to 6 in. high; flowers blue.

Barleria Mackenii, *Hook. f.*

Kwebe, *Lugard*, 124.

Flowers blue.

Barleria spathulata, *N. E. Br.* *Folia* petiolata, lanceolata vel elliptica, acuta, basi acuta, glabra; axillae spinulosae. *Spicae* pluriflorae. *Bracteae* spathulato-obovatae, obtusissimae vel emarginatae, brevissime mucronulatae, albo-pruinosae. *Sepala* 4, lanceolato-attenuata, acutissima. *Corolla* subbilabiata, aurantiaco-lutea. *Stamina* 2.

Scilla lanceaefolia, *Baker*.
Kwebe Hills, 3,200–3,600 ft., *Mrs. Lugard*, 47.

***Iphigenia bechuanica**, *Baker* in. Fl. Trop. Afr. vii., p. 562.
Near Kwebe, *Lugard*, 81 ; Kwebe Hills, *Lugard*, 288.

***Iphigenia strumosa**, *Baker* in Fl. Trop. Afr. vii., p. 562.
Kwebe Hills, 3,200 ft., *Lugard*, 59 ; *Mrs. Lugard*, 57.
Flowers green and russet.

Gloriosa virescens, *Lindl.*
Botletle Valley, *Lugard*, 287.

Gloriosa Carsoni, *Baker*.
Botletle Valley, *Lugard*, 213.
Flowers bright yellow with red stripes.

Walleria muricata, *N. E. Br.* *Folia* conferta, 7–12 cm. longa, lineari-lanceolata, attenuata, acutissima, costa subtus spinis parvis uncinatis armata. *Pedunculi* axillares apice bracteati, muricato-scabri. *Perianthium* nutans, segmentis 13 mm. longis.

Plant about 6–8 in. high above ground-level, with the bulb 8–8$\frac{3}{4}$ in. deep in the ground. *Leaves* crowded, erect, the 3–4 lowest small, ovate or ovate-lanceolate, the remainder 2$\frac{3}{4}$–4$\frac{3}{4}$ in. long, 2–3$\frac{1}{2}$ lin. broad, attenuate-linear-lanceolate, very acute, glabrous, armed with very small hooked prickles along the midrib beneath. *Peduncles* axillary, solitary, ascending, recurved at the apex just above the bract, scabrous with minute straight prickles. *Bracts* 4$\frac{1}{2}$–9 lin. long, $\frac{3}{4}$–1$\frac{1}{2}$ lin. broad, linear-lanceolate, acute. *Perianth* drooping, with linear-lanceolate acute segments about $\frac{1}{2}$ in. long. *Anthers* collected into a cone, with exceedingly short filaments. *Fruit* globose, drooping.

Bechuanaland ; near Palapye, 3,000 ft., *Lugard*, 289.

This species seems to be nearest allied to *W. nutans*, Kirk, from which the more crowded leaves, armed with small prickles on the midrib beneath and the scabrous-muricate peduncles readily distinguish it. Lugard states that the natives eat the small round bulbs raw.

Commelinaceae.

Commelina benghalensis, *L.*
Kwebe Hills, 3,300 ft., *Lugard*, 243 ; *Mrs. Lugard*, 148.
An erect annnal, growing to 18 in. high ; flowers blue.

Commelina Forskalaei, *Vahl.*
Kwebe Hills, 3,300 ft., *Lugard*, 136 ; *Mrs. Lugard*, 147.
Stems creeping, rooting at the nodes ; flowers blue.

Commelina imberbis, *Hassk.* ?
Kwebe Hills, 3,300 ft., *Lugard*, 244 ; *Mrs. Lugard*, 146.
Annual, at first spreading, then erect, up to 3 ft. high ; flowers blue.

Alismaceae.

Limnophyton obtusifolium, *Miq.*
Botletle Valley, *Lugard*, 206.
Flowers green.

Cyperaceae.

Kyllinga alba, *Nees.*
Kwebe Hills, 3,300 ft., in dry places amongst rocks, *Lugard*, 67 ; *Mrs. Lugard*, 139.

Cyperus compactus, *Lam.*
Kwebe Hills, 3,300 ft., in dry rocky places, uncommon, *Mrs. Lugard*, 143.

Cyperus fulgens, *Clarke.*
Kwebe Hills, 3,300–3,500 ft., common throughout these hills, not growing in swampy places, *Mrs. Lugard*, 104.
A bulbous species, growing to 18 in. high.

Cyperus articulatus, *Linn.*
Lake River, *Lugard*, 12.

Cyperus Haspan, *Linn.?*
Lake River, *Lugard*, 10.

Mariscus Sieberianus, *Nees.*
Kwebe Hills, 3,300 ft., growing in dry places amongst rocks, uncommon, *Mrs. Lugard*, 142.

Fimbristylis exilis, *R. & S.*
Kwebe Hills, 3,300 ft., very common in dry sandy wastes, *Mrs. Lugard*, 144 ; *Lugard*, 164.

Scirpus corymbosus, *Roth.*
Lake River, *Lugard*, 11.

Gramineae.

Tricholaena rosea, *Nees.*
Kwebe, *Lugard*, 162.

Panicum trichopus, *Hochst.*
Kwebe, *Lugard*, 163.

Eleusine aegyptiaca, *Pers.*
Botletle Valley, *Lugard*, 202.

Diplachne paucinervis, *Hack.*
Botletle plains, near Macharachara, *Lugard*, 218.

Eragrostis pilosa, *Beauv.*
Kwebe, *Lugard*, 165.

Eragrostis superba, *Peyr.*
Kwebe, *Lugard*, 178.

Filices.

Actinopteris radiata, *Link.*
Kwebe Hills, 3,300 ft., *Mrs. Lugard*, 226.
Grows to 5 in. high, amongst rocks in dry places, luxuriant from December to March, and found later after showers.

Pellaea Calamelanos, *Link.*
Kwebe Hills, 3,300 ft., *Mrs. Lugard*, 225 ; *Lugard*, 167.
Grows to 10 in. high, amongst rocks in dry parts, luxuriant from December to March, and found later.

XV.—A FUNTUMIA DISEASE.

(*Nectria funtumiae*, Massee.)

G. Massee.

A "canker" disease affecting *Funtumia elastica*, Stapf, was first brought to the notice of Kew in January, 1908. Mr. M. T. Dawe, F.L.S., Superintendent of the Scientific and Forestry Department, Entebbe, Uganda, submitted specimens in spirit of this "canker" for examination, together with a photograph taken by Dr. Christy. From the material it was not possible to arrive at an exact determination of the disease, but it appeared to be of the nature of "Slime Flux." Further material, in spirit, of cankered *Funtumia* was received in August, 1908, which appeared to represent an incipient stage of the disease, but it was not possible to do more than refer the disease to some form of "Slime Flux." Towards the end of the year Dr. Christy brought adequate material of the diseased *Funtumia* to Kew; this has enabled the fungus causing the disease to be determined.

The trunk is the part attacked, usually at a point four to six feet above the ground, never higher up where the trunk reaches above surrounding undergrowth and the air is drier. The first obvious indication of the disease is the appearance of a small black patch in the bark, which gradually extends until it may cover an area of a square foot or more. In some cases it is confined to one side of the trunk and in others the trunk may be completely girdled by the diseased area. As the disease progresses the bark increases very much in thickness, and becomes much cracked and rugged, presenting the appearance of large wounds caused by the disease known as "Slime Flux." A species of *Nectria* has been found to be the primary cause of injury. A few perithecia were observed on some of the dry material collected by Dr. Christy; this was soaked in water for three days, and afterwards kept at a temperature averaging 75° F. At the expiration of five days both forms of fungus fruit appeared on the bark and wood on the diseased area. The conidial form appears in the form of minute snow-white tufts, bearing the usual *Fusarium* type of conidia, measuring 40–45 × 3·5–4 μ. This is followed by the *Nectria* or ascigerous condition. The fungus proves to be new, and may be described as follows:—

Nectria funtumiae, Massee. *Coespituli* erumpentes minuti, 3–6 peritheciigeri, sparsi. *Perithecia* globoso-depressa, glabra, levia, coccinea, 350–400 μ diametro, ostiolo crasse obtuseque papillato brunneo instructa. *Asci* cylindracei, apice obtusi, rotundati, octospori. *Sporidia* oblique monosticha, elliptica, hyalina, 1-septata, 14–15 × 6 μ.

In truncis vivis *Funtumiae elasticae*.

Allied to *Nectria ditissima*, Tul., the well-known canker-forming parasite on various kinds of trees. *N. funtumiae* differs in the much larger perithecia and in the more prominent ostiolum; also in the perithecia being grouped in small scattered tufts.

The general appearance and mode of extension of the diseased patches agree closely with the cocoa-tree canker disease of Ceylon,

which is also caused by a species of *Nectria*. In all probability remedial measures similar to those undertaken in Ceylon, which consist in cutting out the diséased patch at as early a stage of development as possible, and protecting the wounded surface with tar or some available substance would prevent the spread of the disease. We are informed that the disease is not of a very serious nature and that but little injury to the tree follows. The tapping-knives, however, may frequently be broken should they come in contact with a canker, and no latex is obtained from the wounded portions of the trunk.

XVI.—THE HERBARIUM SAVATIER.

Otto Stapf.

Mme. L. Raoul, the daughter of the late Dr. P. A. L. Savatier, having offered the herbarium of her father to Kew for purchase, the whole of the collections included in that herbarium have been acquired for the Royal Botanic Gardens. They consist of two sets; one numbering 730 specimens comprises only Japanese plants, whilst the other, which numbers 735 specimens, is made up of several collections, mainly from Tahiti, Peru, the Straits of Magellan, and other parts of South America, under the general description "Campagne de la Magicienne."

The Japanese set is of particular interest and value, as it goes a long way to illustrate the "Enumeratio Plantarum in Japonia Sponte Crescentium," by Franchet and Savatier, the first comprehensive and methodical attempt at a flora of Japan on a scientific basis. Savatier's Tahiti plants were worked out and incorporated by Drake del Castillo in his "Flore de la Polynésie Française," and furnish therefore authenticated and important material for the study of the flora of Eastern Polynesia. The American plants, on the other hand, are only partly named, but as they are well localised, and like the rest, well preserved, they represent a valuable accession to the collections at Kew.

Dr. Paul-Amedée-Ludovic Savatier was born at Oléron (Charente Inférieure) on October 19, 1830. Educated at the Naval Medical School at Rochefort, he quickly rose to a distinguished position in the medical staff of the French Navy. In 1865 he accompanied, as medical officer, a mission of engineers to Japan which had for its object the building and organisation of a Japanese navy. During six out of the ten years he spent in Japan he was stationed at Yokosuka, to the south of Yokohama. Deeply interested in natural history he soon saw his opportunity, for though much had been written by European authors about Japanese plants, beyond Miquel's "Flora Japonica" (Catalogus Musei Lugduno-Batavi, I.)—a mere list of names, no comprehensive and methodical attempt at a flora of Japan had been made. On the other hand, the Japanese possessed by that time three profusely illustrated works on their flora (1) Kwa-wi (Collection of Plants), by Shimada Yonan, dated 1759; (2) Honzo Zufu

(Illustrated Treatise of Botany), by Iwasaki Tsunemasala, published 1828 ; and (3) Somoku Zusetzu (Illustrations and Descriptions of Plants), by Jinuma Yokusai, which appeared in 1856. Although the plants of the Somoku Zusetzu were arranged according to the Linnean system, and the Latin names were frequently given, there was no systematic collation of the Japanese plants, as figured in these works, and their vernaculars on one hand, with the scientific nomenclature of European botanists on the other. To achieve this object and to initiate Japanese botanists into the western systems of classification was Savatier's immediate aim. He made himself acquainted with the Japanese botanical literature and, together with his pupil Saba, translated the Kwa-wi (Paris, 1874), engaging a Japanese artist to delineate the plates, which were, unfortunately, never published. Last, but not least, he collected zealously in the neighbourhood of his station, and over a considerable part of Nipon, whilst European residents in various parts of Japan and Japanese collectors helped him by contributing plants. He himself is credited with having collected about 1,600 species, out of which over 100 were found to be new, or at least new to Japan. The results of his labours are displayed in the "Enumeratio Plantarum in Japonia Sponte Crescentium," which, under the joint authorship of A. Franchet and L. Savatier, appeared in two volumes (Paris, 1875 and 1879). The aim which Savatier had in view was fully realised by that work, which must have been of immense value to the Japanese in their endeavour to adjust their botanical taxonomy on a modern basis. The herbarium material which Savatier supplied directly and indirectly towards the elaboration of the " Enumeratio " was deposited in the Muséum d'Histoire Naturelle, at Paris, but he retained at the same time a large set for himself, and it is this which has now been acquired by Kew.

Having returned to France in 1876, Savatier was at once attached as " Médecin en chef " to the French Naval Division then about to leave for the Pacific, of which the flagship was the frigate " La Magicienne." Touching at the Cape Verd Islands and Montevideo, the division reached Punto Arena early in February of the following year. After a short stay in the Magelhan Straits (February 8 to 25), it proceeded to Valparaiso (March 9–20) and then to Callao (March 29 to April 29), whence Savatier made excursions into the interior as far as Oroyo. After a short stay at Ancon near Lima (April 29 to May 2), he went with " La Magicienne " to San Francisco and then to the Marquesas Archipelago where Nukahiwa was visited (August 14–20). After a prolonged cruise in the Pacific, Valparaiso was again reached early in 1878 (January 4 to March 19). Then followed a second visit to Callao (March 28 to April 25) with more excursions along the Andine railway and a visit to the Island of San Lorenzo off the port of Callao. After a short stay on the barren coast in the extreme north of Peru (Payta, April 28 to May 8), the division went once more to the French possessions in Eastern Polynesia, and it was then (June 20 to July 29) that Savatier made that collection of Tahiti plants of which he says that it included the greatest part of the flora of the island with the exception of the highest peaks. Early in 1879 (January 20 to February 7) we find him again in the

Magelhan Straits, this time homeward bound. A brief account of the voyage of "La Magicienne" by Savatier was published in Archives de Médecine Navale, vol. xxxiii (1880), pp. 5–35.

After a short service in Senegambia, Savatier retired as "médecin en chef de la marine," and died at Saint-Georges d'Oleron on August 27, 1891.

XVII.—MISCELLANEOUS NOTES.

The designation of the post of Principal Assistant in the Royal Botanic Gardens has been changed by authority of the Treasury to Assistant Keeper. Mr. G. Massee, F.L.S., hitherto a Principal Assistant in the Herbarium, and Mr. C. H. Wright, whose appointment as successor to Dr. Stapf was notified in *Kew Bulletin*, 1909, p. 24, will rank as Assistant Keepers.

The President of the Board of Agriculture and Fisheries has been pleased to appoint Mr. N. E. Brown, A.L.S., hitherto an Assistant in the Herbarium, and Mr. L. A. Boodle, F.L.S., hitherto Assistant in the Jodrell Laboratory, Assistant Keepers.

Mr. W. Dallimore, who entered Kew as a young gardener in 1891, and has since 1896 been Foreman in the Arboretum, has been appointed by the President of the Board of Agriculture and Fisheries an Assistant in the Museums.

Dr. F. E. Fritsch, who has filled with much acceptance the post of Lecturer in Physics and Chemistry at Kew since March 8, 1903, has found it necessary, owing to the pressure of other engagements, to resign this duty. Dr. P. Haas, Lecturer on Chemistry at St. Thomas's Hospital, has been appointed to succeed Dr. Fritsch.

We learn that Mr. J. B. Carruthers, F.L.S., formerly Assistant Director of the Royal Botanic Gardens, Ceylon, and subsequently Director of Agriculture in the Federated Malay States, has been appointed Assistant Director of the Department of Agriculture, Trinidad.

We also learn that Mr. F. A. Stockdale, B.A., F.L.S., since 1905 Mycologist and Lecturer in Agriculture to the Imperial Department of Agriculture for the West Indies (*K.B.*, 1905, p. 60), has been appointed Assistant Director of the Department of Science and Agriculture, and Government Botanist, British Guiana.

Botanical Magazine for March.—*Cycas Micholitzii*, Dyer, was introduced in 1904 from Annam by Messrs. F. Sander & Sons, through their collector Mr. W. Micholitz. The species, of which there are examples in the living collection at Kew, is remarkable

on account of the repeated dichotomy of the pinnules. The stems are more slender than is usual in the genus, and have a distinctly thickened base. *Saxifraga scardica*, Griseb., has been introduced from the Balkan Peninsula by Mr. R. Farrer, of Ingleborough, and a living plant, from which the drawing was prepared, has been presented by Mr. E. H. Jenkins, of Hampton Hill. At t. 8058 a variety was figured for which the name *S. scardica* var. *obtusa*, Sprague, is now proposed. It is the plant usually met with in cultivation, and differs from the type figured in this month's issue by having the lower leaves subacute, with 5–11 intramarginal pits, green 1–3-flowered stems, and green obtuse calyx-lobes, which are relatively free from pubescence. *Pseuderanthemum seticalyx*, Stapf, is an Acanthaceous plant from Tropical Africa, seeds having been sent to Kew by Mr. J. M. Purves, of the Forestry and Botanical Department, Nyasaland Protectorate. It is the *Eranthemum seticalyx*, C. B. Clarke, of the Flora of Tropical Africa, vol. v. p. 172. Its salver-shaped corollae have a slender pale red tube and a limb 1 in. across, cinnabar-red above, paler beneath. *Nigella integrifolia*, Regel, is a somewhat inconspicuous annual, which has been grown at Kew since 1894, when seeds were received from the Imperial Botanic Gardens, St. Petersburg. Flowering specimens were also received in 1907 from Mr. W. E. Gumbleton. Its small dark blue bell-shaped flowers resemble those of a *Campanula*. It is a native of Turkestan. The Japanese *Rubus Koehneanus*, Focke, was purchased from Mr. L. Späth, of Berlin, under the name of *R. moriifolius*, from which, however, it proves to be distinct. It forms a bush about 3 ft. high, and has fine lobed leaves and produces an abundance of pretty white flowers and orange-red fruits.

Flora Capensis.—The issue of the concluding part of the first section of Vol. IV. of this work, edited by Sir W. T. Thiselton-Dyer, has now to be recorded. The section includes 1168 pages, and has appeared in six parts, the dates of publication of which have been as follows :—

Part I., pp. 1–192,	was published		May, 1905.
Part II., pp. 193–336,	„		August, 1905.
Part III., pp. 337–480,	„		October, 1906.
Part IV., pp. 481–672,	„		November, 1907.
Part V., pp. 673–864,	„		March, 1908.
Part VI., pp. 865–end,	„		February, 1909.

The orders dealt with are Corollifloral, from Vacciniaceae to Gentiananceae.

The editor's preface, in which the history of the production of this very important volume has been given in detail, is reproduced below :—

As pointed out in the Preface to Section 2, the preparation of the preceding one, which is now completed, was delayed by unavoidable difficulties. It comprises two of the most important orders in the South African flora, the *Ericaceae* and *Asclepiadeae*, in both of which the specific characters require minute and therefore often lengthy description. The bulk of this section has grown accordingly, and it is actually equivalent to that of two ordinary volumes.

Dr. Harry Bolus, who has given such munificent encouragement to Botany in South Africa, kindly undertook the elaboration of *Ericaceae*, which for many years he had assiduously studied in the field. Professor Francis Guthrie, LL.B., B.A., who had long collaborated with Dr. Bolus, unhappily died on October 19, 1899. The elaboration of the intricate genus *Erica* is the result of their joint labours. The loss of his fellow-worker and his own indifferent health, compelled Dr. Bolus to abandon reluctantly proceeding with the remaining genera. These were undertaken by Mr. N. E. Brown, A.L.S., who, in working them out, found it necessary to establish some new ones, and in other respects to depart from the published key to the order. He has accordingly prepared a new one, which will be found in the "Additions and Corrections" at page 1123 of this Section.

Mr. N. E. Brown has also worked out the *Asclepiadeae* with immense pains. He has had the advantage of following Dr. R. Schlechter, an acute botanist who has few rivals as a collector. Both have been disposed perhaps to cut their species rather fine. But South African botanists in the future will find less difficulty in uniting species which cannot be sustained than in separating those which have been injudiciously united. Mr. Brown has himself been occupied with the study of the fascinating group of *Stapelieae*, both under cultivation and in the herbarium, for the past forty years, and it may be hoped therefore that his conclusions will have reached some finality. He has been led to the important result that many supposed native species have arisen from cross-fertilisation in European gardens. It is, however, a singular circumstance that some of the species which were the earliest described, and which cannot be accounted for in this way, have never been met with again by subsequent collectors. It is to be feared that one of the most striking features of the South African flora is doomed to gradual and irremediable extinction.

Mr. W. P. Hiern, F.R.S., who is the acknowledged authority on the order, has undertaken the *Ebenaceae*. In his monograph published in 1873 he had already taken up two species of *Royena* left by the late Professor Harvey in manuscript.

For some of the smaller orders it has also been possible to make use of Harvey's work. It is somewhat remarkable that two species of *Jasminum* of which he left descriptions have remained since 1865 unanticipated in publication by any other describer.

Dr. Stapf, F.R.S., has elaborated the *Apocynaceae*.

Lieut.-Colonel Prain, C.I.E., F.R.S., the Director of the Royal Botanic Gardens, has undertaken *Loganiaceae* with Major H. A. Cummins, C.M.G., and *Gentianeae* with Mr. A. W. Hill, the Assistant-Director.

For the limits of the regions under which the localities are cited in which the species have been found to occur, reference may be made to the Preface to Vol. VI.

I continue to be indebted for invaluable aid to Mr. C. H. Wright, A.L.S., now Assistant Keeper, and to Mr. N. E. Brown, A.L.S., Assistant in the Herbarium of the Royal Botanic Gardens, the former in reading the proofs, and the latter in working out the geographical distribution.

Besides the maps already cited in the Prefaces to Volumes VI. and VII., the following have also been used :—

Map of the Colony of the Cape of Good Hope and neighbouring territories. Compiled from the best available information. By John Templer Horne, Surveyor-General. 1895.

Stanford's new map of the Orange Free State and the southern part of the South African Republic, &c. 1899.

Carte du Théâtre de la Guerre Sud-Africaine. Par le Colonel Camille Favre. 1902.

To many of the South African correspondents of Kew enumerated in previously published volumes I have again to tender my acknowledgments for the contribution of specimens in aid of the work to the Herbarium of the Royal Botanic Gardens.

I must further record my obligations to some new contributors, and to those whose kind assistance in various ways has been of the greatest value in the preparation of this section of Volume IV.

Harry Bolus, Esq., D.Sc., F.L.S., has continued his generous gifts of specimens, besides lending others from his herbarium of *Asclepiadeae* and *Gentianeae*, including many types of Dr. Schlechter's species.

Dr. John Briquet, Director of the Botanic Garden, Geneva. Loan of specimens from the Delessert Herbarium.

Paul Conrath, Esq. Plants from the Transvaal.

Joseph Burtt Davy, F.L.S., Government Agrostologist and Botanist, Transvaal. Plants from the Transvaal.

Dr. Casimir de Candolle, Geneva. Photograph and loan of specimen from the Candolleau Herbarium.

Geheimrath Dr. A. Engler, Director of the Botanic Garden and Museum, Berlin. Loan of *Gentianeae*.

Dr. H. O. Juel, Director of the Botanic Garden, Upsala. Loan of portions of Thunberg's herbarium.

Prof. Paul Henri Lecomte, Jardin des Plantes, Paris. Photographs of Lamarck's types of *Chironia*.

Miss R. Leendertz. Plants from the Transvaal.

Dr. H. W. C. Lenz, Director of the Museum, Lubeck. Loan of E. Meyer's types of *Asclepiadeae* and *Gentianeae*.

Dr. C. A. M. Lindman. Loan of specimen of *Chironia* from the herbarium of P. J. Bergius, Stockholm.

Dr. John P. Lotsy, Director of the Royal Herbarium, Leiden. Loan of specimens of *Gentianeae*.

Dr. Rudolph Marloth, Capetown. *Stapelieae*, living and in fluid.

Miss A. Pegler. Plants from the Transkei.

Dr. G. Albert Peter, Director of the Botanic Garden, Gottingen. Loan of specimens of *Gentianeae*.

N. S. Pillans, Capetown. Large collection of *Stapelieae*, living and in fluid, including many new species, and the loan of his large and valuable herbarium of the group. The generous aid of this enthusiastic collector and the free use of his copious notes have been of the greatest value in the difficult task of working out the species.

Humphrey John Sankey, Esq. Plants from the vicinity of Harrismith, Orange River Colony.

Dr. Hans Schinz, Director of the Botanic Garden and Museum, Zürich. Numerous specimens collected by Dr. R. Schlechter; loan of *Gentianeae*.

Dr. Selmar Schönland, Curator of the Albany Museum, Grahamstown. Small collection of *Asclepiadeae* and loan of *Gentianeae*.

Prof. Albert Charles Seward, F.R.S. Loan of *Gentianeae* from the University Museum, Cambridge.

Miss Ethel West. Plants from Port Elizabeth.

John Medley Wood, A.L.S., Director of the Botanic Gardens, Durban. Numerous specimens of *Asclepiadeae* and loan of *Gentianeae*.

Prof. E. Perceval Wright, Sec. R.I.A., Keeper of the Herbarium, University of Dublin. Loan of portions of Harvey's herbarium.

Dr. Alexander Zahlbruckner, Keeper of the Botanical Collections of the Naturhistorische Hofmuseum, Vienna. Loan of specimens of *Asclepiadeae* and *Gentianeae*.

On this occasion it is appropriate to pay a brief tribute to the memory of Sir Henry Barkly, G.C.M.G., K.C.B., F.R.S., who died on October 21, 1898. It was at his instance that during his last period of official life as Governor of Cape Colony (1873–7) the preparation of the *Flora Capensis* was resumed, and it was due to his support that the approval and aid of the Legislature of Cape Colony and Natal were secured. He was deeply interested in the *Stapelieae*, of which at the time the study had been comparatively neglected. He collected and cultivated as many as he could, and also sent a large living collection to Kew. Lady Barkly and Miss E. B. Barkly made water-colour drawings of them as they flowered. Of these copies were sent to Kew, together with specimens in alcohol, accompanied by copious descriptive notes. An account of this material was published in Hooker's *Icones Plantarum*, tt. 1901–25; and coloured figures of four of the species that flowered at Kew appeared in the *Botanical Magazine*. The whole of Sir Henry Barkly's material was a contribution to the study and elaboration of the group only second perhaps in value to that of Mr. Pillans.

I may be permitted more personally to express my indebtedness to Lieut.-Colonel Prain for kind and unfailing assistance in many ways, without which the task of editing a work of this kind at a distance from the resources of Kew would be one of peculiar difficulty.

The critics of niceties of nomenclature, which often seem to obscure the interest of larger problems, will probably notice that the Kew tradition has been adhered to, and the supposed right of priority of the original specific epithet has been disregarded where an existing name is available which has correctly placed a species in the genus to which its affinity is most obvious. The principle was laid down by Sir Joseph Hooker in 1872 in *The Flora of British India*. Its justification is based on technical grounds equally with those of common sense. It may be convenient to briefly state them :—

i. The so-called binominal nomenclature which we employ was devised by Linnæus, and, as with everything he did, on a logical and definite basis. Nothing but confusion can arise by departure

from this. To the specific epithet, apart from its proper function, Linnæus attached no importance at all. He saw that the scientific problem was to get the species into its right genus. "Nomen specificum sine generico est quasi pistillum sine campana." The specific name taken alone is the clapper without the bell. A Linnean name, then, though it consists of two parts, must be treated as a whole. "Nomen omne plantarum constabit nomine generico et specifico." And the same principle obviously applies to all names constructed in accordance with Linnean rules. The supposed appeal to justice begins by repudiating the authority of the lawgiver. Alphonse de Candolle appreciated the true position when he said: "The real merit of Linnæus has been to combine, for all plants, the generic name with the specific epithet."

ii. But the claim for justice works the greatest injustice, and it is not even tempered with mercy. Any careless or incompetent botanist can tack on a blundering name to an undescribed plant, and his blunder with his name attached is to be handed down to posterity for all time. As Linnæus saw, the real scientific feat is to discover its true affinity, not to give it a haphazard label. And the author who does this successfully is the one whose insight deserves commemoration. It is impossible not to agree with Sir Joseph Hooker when he says: "I regard the naturalist who puts a described plant into its proper position in regard to its allies as rendering a greater service to science than its describer when he either puts it into a wrong place or throws it into any of those chaotic heaps, miscalled genera, with which systematic works still abound."

iii. Every revision of the contents of an order involves a reconsideration of the mutual affinities of its contents, and this usually involves some transposition of species from one genus to another, or the creation of new genera. It may be hoped that the process is generally judiciously accomplished. But in any case it yields a crop of synonyms. This is inevitable, and these in a work like the present have to be examined and quoted. The labour involved will be evident from many of its pages. There is said to be a species of *Fimbristylis* with 135 synonyms. Taxonomic science must in the end be crushed by its own literary top-hamper. The only remedy eventually will be to draw a line behind which synonymy will be ignored. But we need not add to the burden by the creation of a new specific name when one which is valid and available already exists in the genus. The appeal to justice lays itself open in such cases to the suspicion of being little more than a cloak for the vanity of the author.

I have equally resisted the wholesale manufacture of new specific names by the revival of obsolete or forgotten genera without any obvious necessity. Nomenclature is a mere means to an end; it is ignominious to become its slave, and we alienate the sympathy of the public, which we wish to secure, by changes of familiar names which, to its eyes, must seem simply wanton.

The expenses of preparation and publication of the present section of Volume IV. have been aided by grants from the Governments of Cape Colony and Natal. The Government of the Transvaal has not hitherto been associated with the work. It

is a gratifying evidence of the appreciation of its usefulness in South Africa that that Government has now spontaneously also made a grant in aid of its publication.

A Substitute for Lignum Vitae.—In the *Indian Forester* for December, 1908, p. 717, a short account is given of a substitute for the Lignum Vitae (*Guiacum officinale*, L.) of the West Indies. The new wood is called Mancono (*Xanthostemon Verdugonianus*, Naves) and is found in considerable abundance in north-eastern Mindanao, Philippine Islands.

The wood is said to be so heavy and hard that it is difficult to cut and the splitting of a log is almost impossible. According to Mr. Dunlap of the Bureau of Forestry for the Philippine Islands it grows along steep slopes near beaches, whence it can be shipped by water transportation, and as it is only required for use in short lengths the work can all be done in the forests. The wood of the Mancono tree even in the Tropics is practically indestructible and is not attacked by white ants. Many of the Filipinos of the Southern Islands use the logs for posts and ground timbers.

The heartwood of the tree is uniformly reddish-black, but after a number of years of seasoning it turns a black walnut colour. Like all Philippine hardwoods it takes a fine polish.

The wood is of such density that it sinks in water, so that the logs have to be rafted between native boats to keep them on the surface of the water when being taken to the steamer.

The wood has been used as a substitute for Lignum Vitae at the United States Naval Station, Cavite, P.I., and has been pronounced a success after a year's trial. It has also been satisfactorily tested in the shipyard of the Bureau of Navigation, Manila.

Remedies for Snake Bite.—Specimens of two plants collected by Mr. E. St. J. Lawson, the head of the Police in Siam were forwarded to Kew by his brother Dr. Arnold Lawson, F.R.C.S., together with a letter and report in which it is stated that the plants are very efficacious in the cure of snake bites in Siam. The plants proved to be *Barleria Prionitis*, Linn. and *Justicia Gendarussa*, Linn. f.

In his letter Mr. E. St. J. Lawson says of the two plants, the first [*Barleria Prionitis*] appears to have remarkable qualities in curing persons bitten by cobras, and the second [*Justicia Gendarussa*] is alleged to be still more efficacious . . . . "

Dr. Arnold Lawson has permitted us to publish his brother's report on an interesting case of snake bite in which it is mentioned that a decoction of the *Barleria* was frequently used and found efficacious, though it does not appear to have been able to avert death in the case of the bite of a hamadryad though death was delayed for a considerable time.

The report with a few omissions and verbal alterations is as follows :—

"Nai No, a labourer, aged 26, lived in Bantawai . . . . with his adopted mother Amdeng Chan in Bantawai.

"He has for many years amused himself with snake-charming and snake-training, but did this for a hobby and not as a trade.

"During the past three years has been bitten by cobras at least ten times, but has always cured himself by taking the medicine he kept for the purpose.

"On 30th September, being a holiday, Nai No went out and returned later in the day with two hamadryads (king cobras) that he had caught. Length about 7 feet each.

"On October 3rd at 6 p.m. Nai No took these two snakes out of the jar in which he kept them . . . . and began to play with them, holding one in each hand. One of the snakes got angry and bit Nai No on the right arm above the wrist. He then put the snakes away and took his usual medicine but it did not have its usual effect. Three minutes after taking the dose of medicine he vomited. Five minutes later he took a second dose which he retained. At 2 a.m. he vomited again and then took more medicine. At 11 a.m., October 4th, he vomited again and wished to take more medicine but was unable to swallow.

"He then instructed his adopted mother to fetch more of the plant from which the medicine is made and to make up a fresh dose telling her where to find the plant. She did according to his instructions and bringing the plant to him prepared it according to his instructions. She then gave the preparation to him but he had spasms in his throat and could swallow nothing.

"Nai No died about 1 p.m.

"The corpse and snakes were sent to Police-Surgeon Dr. Fysche who certified that death was from snake-bite . . . ."

Memorandum.

"The fact that Nai No had been frequently bitten by cobras and had cured himself every time is about as well established as anything resting on such essentially weak evidence as is all human testimony can be. It may be argued that the snakes were not cobras. The only reply is that people accustomed to cobras say they were, and there is not the least reason to believe that the witnesses are not stating what they believe true. Leaving, however, the past aside we have this absolute certainty Nai No was bitten by a hamadryad (king cobra) at 6 p.m. on October 3rd, and did not die until 1 p.m. on October 4th. The bite of the hamadryad is regarded as at least as dangerous (most people regard it as more rapidly fatal) as the bite of the cobra.

In my long experience of nearly 18 years during which time literally thousands of enquiries regarding death from cobra bite have come before me I cannot recall a single instance in which the person bitten survived more than two hours. In the vast majority of cases death occurred within 30 minutes of being bitten.

The medicine used by Nai No is prepared as follows :—

The leaves and twigs of a plant named in Siamese 'Salate phang poru' are pounded in shamshoo (rice spirit). The liquid is taken internally and the solid left after pounding is placed on the wound. The medicine must be taken immediately after being bitten. I have been unable to discover any European name for 'Salate phang

poru.' It is a rare plant. I am sending by this mail the dried leaves and twigs of this plant. They are marked A. and are the twigs with thorns. [*Barleria Prionitis.*]

In a separate box are sent leaves and twigs of another plant alleged to be more efficacious and still rarer, but of this I have no reliable proof. This appears to have no name in any language. [*Justicia Gendarussa.*]

Nai No used 'Salate phang poru.' I can get no reliable data as to proportions used."

(Signed) ERIC ST. J. LAWSON.

18/10/08

In a subsequent letter to his brother, dated February 22, 1909, Mr. E. St. J. Lawson says :—

"The Siamese say that *Justicia* is the female of *Barleria*, and the latter never has flowers or fruit, and the former has flowers only but no fruit. I suppose this is nonsense, but I cannot get any flowers of *Barleria* or fruit of *Justicia*. I have gone into the matter more fully since my last letter, and I find that the efficacy of the medicine is generally believed in. Indeed, a man who has been in my service many years has been bitten by what he says was a cobra, took this medicine and recovered ; is perfectly fit at this moment, in fact. As I did not see the snake myself, I am not prepared to express an opinion on this case. As likely as not it was a water-snake or other harmless snake, such being infinitely more numerous than cobras. This, however, in no way applies to the case of Nai No, who most certainly was bitten by a hamadryad. . . . What I refer to as *Barleria Prionitis* is what is known here as 'Salate phang poru.' *Justicia Gendarussa* has no name at all in Siam, as far as I can discover."

There appears to be no record at Kew, nor has any reference been found, as to the use of these plants as antidotes for snake bites, and the interest of Mr. Lawson's communications lies in the evidence they afford that a belief in the efficacy of these two plants prevails among certain classes of Siamese.

According to Watt (Dict. Econ. Prod. Ind.) "the seeds of *Barleria cristata*, Linn., are supposed to be an antidote for snake bite, and the roots and leaves are used to reduce swellings."

Green Ginger.—A query was addressed to Kew by Mr. W. Stevenson of Alfreton as to the nature of the ginger root "which was grown by the peasantry in the later middle ages as 'green ginger.'" In the letter on the subject it is mentioned that "In Hull, adjoining what was known as the gardens of the Great Manor House of the De la Poles, is a short street called 'Land of Green Ginger.'"

Professor Vinogradoff, in his work on "Villainage in England," p. 290, says : "Trifling rents, consisting of flowers or roots of ginger, were sometimes imposed with the object of testifying to the Lord's seignory," and in the Warwickshire Hundred Roll is to be found "per servicium unius radicis gyngibri . . . unius rose."

Mr. W. J. Corbett, Bursar of King's College, Cambridge, informs us that rent was occasionally paid in ginger. "In the

reign of Edward I. a holding of 9 acres at Skipwith, a hamlet of Kirkland in Cumberland, near Cross Fell, paid yearly '1 racinus' of ginger, but that this is all on a par with the still more common practice of demanding a peppercorn rent or a rent in cloves, and that the ginger was bought at a local fair and not grown."

The radix gyngibri was very probably the true ginger, but the green ginger of the Land of Green Ginger refers to *Artemisia vulgaris* (and other aromatic herbs) according to J. F. Robinson, Flora of the East Riding of Yorkshire, p. 128. The name also occurs in Lincoln for *Artemisia vulgaris* (*see* Britten and Holland, Dictionary of English plant names, p. 541).

According to Murray's Oxford English Dictionary green-ginger is the undried root, usually in preserve.

Botanical Journey in the Malay Peninsula.—The following extracts from a letter dated December 18, 1908, addressed to Sir J. D. Hooker, O.M., G.C.S.I., by Mr. H. N. Ridley, F.R.S., are by permission printed here on account of their great general interest :—

"I have just returned from an expedition to Perak and Pahang, where I have collected such interesting additions to our flora as *Sarcopyramis*, *Sanicula*, *Disporum*, besides a number of new species and one or two new genera. I got three Balsams, one very fine thing of which I have only seen scraps before, the Golden-flowered Balsam; the flowers nearly two inches across, and like those of an *Oncidium*, hence I would name it *oncidioides* [*see K.B.*, 1909, p. 11]. I hope to get it alive to Kew next spring; I have plants and seeds which are germinating; the flowers are racemose. The second species much resembles *Griffithii*, but has rather different foliage. The third I have not yet properly examined; it looks like *platypetala*.

"Wray had had specimens of the Golden Balsam, which were sent to me as Gesneraceous, so you may judge how poor they were, and I sent you a scrap, brought me by an amateur, which was quite unidentifiable. It is really a beautiful thing; I drew up description and rough sketch of details in camp.

"As to the rest of the collections, it was very curious to note that directly we passed over the ridge which politically divides Perak from Pahang, though not a bit more striking than any other ridge we crossed, the flora completely changed, and all the Himalo-Javanese things appeared across the border : *Sarcopyramis*, *Viola*, *Disporum*, *Sanicula*, &c., and the zoologists say all the birds there are Himalayan. I am preparing an account of these plants."

Mr. Ridley's detailed account of this journey will be eagerly anticipated.

Materials for a Flora of the Malayan Peninsula.—The appearance of Part 21 of this work by Sir George King and Mr. J. S. Gamble, has coincided almost to a day with the lamented death of Sir George, who himself prepared the first thirteen parts—to the end of the *Calyciflorae*, and with whom Mr. Gamble has been associated in elaborating the *Corolliflorae*. Part 21 which completes the

Corolliflorae contains two families; the *Gesneraceae*, prepared by Mr. H. N. Ridley, F.R.S.—already published in the *Journal of the Straits Branch of the Royal Asiatic Society* for 1905, and the *Verbenaceae*, prepared by Mr. Gamble. The original account of the *Gesneraceae* not being quite in the form adopted throughout the *Materials* as published by the *Asiatic Society of Bengal*, has, with Mr. Ridley's sanction, been re-edited. Only the necessary formal alterations have been made, but Mr. Ridley has taken this opportunity to supply a few notes and to make several additions, including descriptions of three new species, one of which is the type of a new genus. The number of species of this order now described is 131, belonging to 20 genera. The number of species described under *Verbenaceae* is 72, belonging to 15 genera; 16 of the species are new to science. Sir George King was able to examine the sheets of this part as they passed through the press, but this was the only share in its publication that the state of his health permitted him to take. While the various parts included in the *Corolliflorae* were under preparation by Sir George King and Mr. Gamble, Mr. H. N. Ridley undertook the elaboration of the Monocotyledonous families, under the same general title as that originally adopted by Sir George. The appearance of the first part of Mr. Ridley's contribution to this great undertaking was noticed in *Kew Bulletin*, 1907, p. 410. Since then Mr. Ridley has published two more parts completing the Monocotyledons, so that with the account of the Incompletae, on which Mr. Gamble is at present engaged, the task initiated by Sir George King in 1889 will be completed.

Stone Seat in Kew Arboretum.—Enquiries are from time to time made as to the stone seat among the beech trees towards the southern end of the gardens. The seat, which was placed in the position it occupies in February, 1904, was presented to Kew by a group of friends of the late Miss Cassell, who was for twenty years Lady Superintendent of the College for Working Women. It was provided as a memorial by past and present students of the college, to express their sense of Miss Cassell's unique personality. "That it should be a resting-place in sight of sky and trees in such an altogether beautiful place as Kew, and within reach of working Londoners, seems, in accordance with her life spent in working for the working poor, what she would like," is a sentence which occurs in a letter on the subject, written by Mrs. Maclehose, at whose instance the memorial was erected, to her brother, Mr. G. Macmillan. In the same letter Mrs. Maclehose says:—"We should like some motto or words carved on it, but no obviously memorial words—no names." The actual inscription is:—

LIFE—THE GIFT

LET US TAKE HANDS AND HELP THIS DAY WE ARE ALIVE TOGETHER

LOOK UP ON HIGH AND THANK THE GOD OF ALL

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 4.] [1909.

XVIII.—THE ECONOMIC ASPECTS OF THE OIL PALM.

(*Elaeis guineensis*, Jacq.)

An account of the different varieties of the Oil Palm in West Africa has appeared in a previous number of the Bulletin (*K.B.* No. 2, 1909, pp. 33–49), where an attempt has been made to systematise the information obtained from various sources. In the present article it is proposed to deal with questions relating to the habitat, cultivation, yield, &c., of the Palm, the mode of preparation of the oil and other kindred matters.

The information has been derived mainly from the reports received from West Africa in reply to the letter written by the Director of Kew to the Under Secretary of State for the Colonies in February, 1908 (*K.B.*, No. 2, 1909, pp. 33, 34).

Several important papers on the Oil Palm, of which a list is given, have appeared in foreign periodicals and from them, also, extracts have been made.

The following reports from British West Africa have been sent to the Secretary of State for the Colonies and have been forwarded by his courtesy to the Director of Kew :—

(1) The Governor of Southern Nigeria, enclosing reports from Mr. P. Hitchens, Provincial Forestry Officer, Eastern Province; from Mr. C. A. Birtwistle, Commercial Intelligence Officer, and from Mr. N. C. McLeod, Acting Conservator of Forests; (2) The Governor of the Gold Coast, enclosing two reports from Mr. A. E. Evans, Travelling Instructor of Agriculture; (3) The Acting Governor of Sierra Leone (Mr. G. B. Haddon Smith); (4) The Governor of the Gambia, with an enclosure from Mr. G. H. Sangster, Commissioner of the Kommbo and Fogni Province; and (5) the Governor of Northern Nigeria, enclosing a brief report from Mr. B. E. B. Shaw, Forestry Officer.

In addition to the information taken from these reports, extracts have also been made from the 'Notes on the Oil Palm' by Mr. H. N. Thompson, Conservator of Forests, Southern Nigeria,

(12903—6a.) Wt. 108—471. 1375. 5/09. D & S.

published as a supplement to the Government Gazette, Southern Nigeria, No. 10, 1908, and from the articles by M. J. Adam in the French Colonial Bulletin for 1908.

The name of the authority quoted is placed at the end of each extract in the following pages.

Of the nine questions embodied in the Director's letter to the Colonial Office only two were considered in the previous article. In the following pages answers are supplied to the questions as to the habitat of the Oil Palm and the conditions most favourable to its successful growth; as to the yield, commencement of bearing and longevity of the trees; as to the abundance of Oil Palm kernels and of the relation of the supply to the means of communication; and as to whether there has been any improvement in the mode of extracting the oil.

Some other questions relating to the Oil Palm industry are also discussed.

Habitat of the Oil Palm.

The Oil Palm is found on the coast of West Africa from the Gambia (13° N. lat.) as far south as the neighbourhood of S. Paul de Loanda, Angola (9°–10° S. lat.). In the north a few plants have been found in the region of Niayes (about 16° N. lat.) between Dakar and St. Louis. The Palm appears to flourish more particularly along the northern side of the Gulf of Guinea from Sierra Leone to the Cameroons.

It grows to the greatest advantage in the deep, alluvial, humus-covered soil of the forest region which forms a belt of country from 1–300 kilometres in width from Sierra Leone to the Cameroons. Behind this region on the higher land the Oil Palm is still to be found, but this inland zone is not so dense as that of the low lying country and diminishes in importance as it recedes from the coast.

The degree of moisture in the soil is of some importance for the successful growth of the Oil Palm. Where the rainfall is below 50 inches the Palm does not thrive, but it seems to grow equally well in places where the rainfall ranges between 70 and 250 inches; it grows best, however, on well-drained land and will not thrive in swampy land (McLeod). According to Evans it will thrive in almost any soil or situation, but it does not pay to gather the nuts from trees which are growing in the semi-open country near the coast as the yield of oil is exceedingly small. It succeeds best in rich, moist, well-drained land where the rainfall is from 50–70 inches per annum.

It is widely distributed throughout the Gold Coast, but is found in greatest abundance in the Eastern and Central Province.

In Southern Nigeria about three-fourths of the whole region afford suitable conditions of moisture &c. for the growth of the Oil Palm. In Sierra Leone where the country is undulating "the Palms are found to grow both on or close to a swamp where there is always moisture in the soil, and also on a well-drained hill-side where there can be but little moisture in the dry season" (Haddon Smith). It is intended to carry out some comparative examinations of the yield and quality of the fruit of Palms growing in moist and dry situations in Sierra Leone. "In the Gambia the Palm trees are

always to be found in damp places along the banks of streams and in the grass fields which are under water during the rainy season" (Sangster). In Dahomey the plants do not grow on the shallow granitic and gneissic soils in the north, but the rich alluvial soil near the coast is covered with an almost continuous belt of Palms (Adam).

The following account of the Oil Palm in Southern Nigeria is taken from Mr. Thompson's "Notes":—

"The typical species of the Oil Palm appears to be confined, within the limits of Southern Nigeria, to the moist belts of country. It is most plentiful in the native farms and evergreen forests of the Niger Delta, and some of the littoral districts of the Eastern Province, where a heavy annual rainfall is experienced.

"In the hinterland, where the rainfall is deficient, it follows the evergreen belts of forest skirting the larger streams. A dry climate and poor soils do not suit the plant; it is conspicuously absent from the impoverished, grass-covered soils of the hinterland, on which the Fan Palm, *Borassus flabellifer*, and the wild Date Palm, *Phoenix reclinata*, which are so frequently met with, are subject to inundations during the rainy season, and forest fires during the dry period of the year.

"The Oil Palm flourishes best on the rich alluvial humus-covered soils of the forest region. It will also grow on rocky soils, provided there is a sufficient rainfall to bring about a weathering and disintegration of the surface layers of rock.

"Its absence from large tracts of country in the hinterland is most probably due to the annual impoverishment of the soil from exposure to the sun and forest fires, and also to the reduction (during the dry season) of the moisture held by the soil as well as in a few cases to an annual deficiency in the annual rainfall itself.

"Along the dry, sandy shores of the Lagos and Badagry lagoons this partiality of the plant for the richer soils can be easily traced. On the dunes nearest to the sea and lagoons the only palms to be met with are the Fan Palm; a little farther back, where scrubby vegetation has had sufficient time to establish itself and take possession of the soil, and a certain amount of leaf mould exists in consequence, a few very tall, thin, lanky individuals of the typical Oil Palm make their appearance, in company with well-grown examples of the variety of Oil Palm known to the Yorubas as the King Palm, or Ope-Ifa. In this, the habitat *par excellence* of the latter, the growth of the typical species is poor in the extreme, and it is only well back from the shores, where vegetation has had time enough thoroughly to clothe the old sand dunes, enrich the soil, and increase the amount of moisture retained by it, that the type species is at its best.

"The rainfall of the localities referred to is practically the same along the shores of the lagoons as it is three or four miles farther back, where the ordinary variety of the Oil Palm grows so luxuriantly. The real factors that here determine the vigorous growth of the Oil Palm are the increased richness of the soil, due to the presence of decaying organic substances derived from the vegetation growing on it, and the simultaneous increase in the amount of water held in suspension by the soil.

"These considerations explain the absence of the plant from the dry, open districts of the hinterland, where, owing to the destruction of the forests for farming, and the prevalence of 'bush fires,' the organic matter in the soil has been reduced in quantity, and the regulation of the supply of moisture in it has been so disturbed that at one time of the year there is often too much, and at other times too little of it to suit the majority of plants. The actual amount of rainfall in these districts is frequently quite sufficient to ensure luxuriant vegetation if a larger percentage of the rain-water could be held in suspension by the soil during the rains, as is the case with forest-covered soils" (Thompson).

From the foregoing extract it seems clear that a large tract of country in Southern Nigeria is suitable for the growing of Oil Palms should the state of the market demand a larger supply. Thompson proceeds to remark that—"in any efforts that may be made to re-establish this Oil Palm in the open country to be traversed by the Osogbo-Ilorin extension of the railway, the first thing to do will be to protect the area from the annual fires, and allow the forest to grow up again. When the latter is firmly established, the planting up of the land with the Oil Palm can be undertaken with some prospect of success. Re-afforestation can, of course, be hastened by planting up the area with quick-growing trees, shrubs, &c.; but fire-protection is the essential factor in any such scheme, and will have to be rigorously enforced."

M. Adam in summarising the information he has collected on the habitat of the Oil Palm (Adam, l.c. No. 72, March, 1909, p. 225) points out that the palm in French West Africa is a plant of the coast region. The most flourishing, natural groves are concentrated in a belt of country near the sea, and the palm looses its luxuriant character towards the interior owing to the insufficiency of moisture for vigourous growth. At high altitudes it is found to disappear and the best returns are given by trees in the low country where the soil is alluvial, well drained, rich in humus and damp, without being marshy. In somewhat poor soils near the coast the Oil Palm is also found to flourish and this appears to be due to the excellent physical constitution of the soil combined with a sufficient degree of humidity.

Plantations.

Very little appears to have been done by the natives of West Africa in making definite plantations of the Oil Palm. It is looked upon by them as a protected tree, and is rarely destroyed when land is cleared for cultivation, thus, as Thompson points out:—

"Where Oil Palms already happen to exist in fair numbers when the land is cleared for farms, seedlings sprout up in immense numbers about a year or two after the clearings are first made, from seeds dropped several years before. These seedlings are frequently thinned out and planted all over the farms, this being usually done in the rainy season. With the above exceptions no particular efforts are made to stimulate the natural regeneration of the species.

"Very little planting seems to be undertaken by the natives in other parts of Southern Nigeria. The large numbers of Oil Palms

met with in well cultivated districts of the Eastern and Central Provinces are due to spontaneous growth that springs up under the protected mother trees when these areas are cleared for farms. At each successive felling rotation of the forest growth that springs up on the fallow land, more seedlings sprout up and are in their turn spared from destruction. The area thus eventually becomes thickly covered with that species."

In the Gold Coast Mr. Evans states that :—

"The Krobos are the only natives who really pay any marked attention to the cultivation of Oil Palms. Their plantations, which are said to have been planted with Oil Palms about 40 years ago, are an example of native industry not at all compatible with the reputation which is often attributed to the natives of this Colony. All decayed branches are cleared off, and the heavy shade of the palm trees prevents the growth of weeds, so that the plantation presents a very tidy appearance; and it would well repay natives from other parts of the Colony interested in the palm oil industry to pay these plantations a visit."

The cultivation of the Oil Palm appears to have reached a higher state in the French Colonies than in our own. In Dahomey the increased facilities for transport due to the railway have led to a marked encouragement of the Oil Palm industry. Between Porto Novo and Sakété all the palms are said to be cultivated, the groves are cleared in great part, maize, manihot, and other food plants being grown amongst them. The Oil Palms benefit from attention given to the soil, but unless manure is given its fertility will naturally tend to diminish owing to the constant succession of crops.

In Guinea, M. Adam describes and figures the plantations of Pine-apples and Bananas which have been made in the palm groves of Camayenne, near Konakry, which appear to be in a flourishing condition.

M. Adam in the last published number of the French Colonial Bulletin (No. 72, pp. 229–243) deals at length with the question of the cultivation of the Oil Palm and particulars are given of the mode of clearing the ground, planting of the seeds, &c.

The nursery should be situated near a pool or water-course in order that the proper humidity of the soil may be assured. If this is not possible seeds should only be sown at the commencement of the rainy season. A light shade for the soil, either natural or artificial, is also essential.

The seeds, which should have been recently collected, germinate in four to five weeks and should be planted in the nursery at distances of about 18 inches apart.

Young plants found in the bush or those raised in the nursery should be planted out when they are from 2 to 3 feet high, that is when they are from one to two years old. The plants submit to transplantation more readily than other palms so that it is not necessary to raise the seedlings in pots.

The young plants should be placed at distances of 20–26 feet apart though the exact distance is dependent on the fertility of the soil. If, however, it is intended to have permanent intercalary cultivation in the plantation the distances between the palms would

have to be increased. In Dahomey according to the figures from various parts the average number of palms to the hectare (2 acres, 1 rood, 35 perches) is about 124.

Careful particulars as to the mode of preparation of the holes and as to the planting of the young palms are also given. Under the heading "maintenance" the importance of attention being paid to the young plantation is emphasised. M. Adam has noticed the following succession of intercalary crops in the palm groves :—

(1) Maize for several years.
(2) Equally during several years, alternate crops of different beans, ground nuts and sometimes yams.
(3) Manihot (cassava) as long as it yields crops, usually from three to four years.

The ground is then left fallow for 15–20 years or more and then the same succession is grown.

The ground is considerably depleted by these crops especially by the cassava, though it gains something from the leguminous plants, and the natives never apply manure. On the question of manuring M. Adam offers some interesting suggestions, which are worthy of consideration. He refers to the complete liberty of cattle and sheep, in consequence of which there is no supply of manure for the crops and suggests that there is a possibility of remedying this state of affairs. He also calls attention to another source of fertilizer for the soil of the plantations at present neglected namely the waste products of the Oil Palms themselves, such as the remains of the fruit pulp, the infloresences and the old leaves. Analysis has shewn that these products are of considerable value, and M. Adam concludes that had some of these neglected means of fertilizing the soil been employed the gradual diminution in the yield of the palms noticeable in many places would not have been witnessed.

In Southern Nigeria it has been noticed that trees growing on old farms are more prolific than those growing in the dense forest. This is due partly to the greater exposure to sunlight that the palms experience on the farms, and partly to the greater amount of attention they receive in the matter of trimming the leaves, &c., on such areas. There appears to be no doubt that tended trees give a greater yield of nuts than those growing uncared for in the forests (Thompson).

The Acting Governor of Sierra Leone writes in his despatch :—

"That steps have been taken to encourage the Chiefs to cultivate the Oil Palm, and that prizes are given to those who plant the largest number of palm trees."

Yield of Nuts, &c.

The age at which seedling Oil Palms come into bearing varies slightly in different places, and appears to depend mainly on the situation in which they are planted.

M. Adam* gives an interesting general account of the Oil Palm, with excellent figures of the inflorescences. The palms commence

* Adam, J. L'Agric. pratique des pays chauds. Bull. Mens. du Jard. Col. No. 68, 1908, pp. 380–387, and figs. 5–10.

to flower usually in their fourth or fifth year, and sometimes in the third. At first male inflorescences only are developed, and it is not until one or two years afterwards that female flowers appear. In a few exceptional cases both male and female flowers are found in the same inflorescence (Adam, *l.c.*, p. 384 and figs. 8 and 9).

The fruits take from two to six months to mature, according to the season of the year at which the inflorescences are formed. In the Gold Coast, according to Evans, the young plants commence to yield their first crop of fruits when about five years old when grown in the rich alluvial lands, but not until the sixth or seventh year in the hilly country, and gradually to increase their yield for 60–80 years. Gruner, referring to the Oil Palm in Togoland, mentions the uncertainty which prevails as to the time of yield. According to some informants the palms commence bearing in their sixth year, and bear only two or three bunches of fruit, the fruits being small. During the next five years the number of bunches increases from 4–6 per year, and in the twelfth year the palm yields its full harvest. Freyburger, quoted by Gruner, states that the bunches of fruit do not become more numerous as the palm grows older, but that both the bunches and the individual fruits increase in size. A young palm, six years old, according to him, bears 1–6 small bunches of fruit, whilst one of 10-20 years of age—the most prolific period—has also 1–6 very large bunches with well developed fruits.

Thompson gives the following particulars as to the growth and yield of the Oil Palm for the Western Province of Southern Nigeria, in Egba land and around Agege :—

"On rich newly cleared forest soil, the Oil Palm is said to bear its first bunches of nuts when it is seven to eight years old. The first bunches are small, about the size of a man's fist, and from eight to thirty of them are formed on the plant annually. As the latter gets older, the bunches increase in size, and are reduced in number to from four to twelve. When the palm is fully grown, that is at about the age of from eight to ten years, the bunches of nuts reach their maximum size, and are developed at the rate of from two to twelve per tree per annum. This rate of yield is continued afterwards practically throughout the natural life of the palm.

"The limits between which the yield varies in the case of full-grown trees are given below :—

"(*a*) Full-grown trees yield from about two to twelve bunches of nuts annually, each bunch weighing from 20 to 56 lbs., according to size.

"(*b*) An average-sized bunch contains at least 200 nuts, and the weight of the latter varies from 7 to 21 lbs.

"(*c*) The annual yield in oil of a tree is at least $7\frac{1}{2}$ lbs. in weight.

"(*d*) The yield of kernel oil is generally 25 per cent. of the nut oil, or one quarter of a gallon per tree per annum" (Thompson).

McLeod (Southern Nigeria) mentions fifteen years as the age at which the Oil Palm reaches its maximum yield, and states that this is maintained up to 150 years of age. According to Thompson and

others, 100–200 years appears to be the natural limit of life for the species.

"In the Akwapim district of the Gold Coast the average annual yield per tree is about eight bunches; but in the Krobo district, where the Oil Palms are well cared for, they are said to yield, on an average, about twelve bunches per tree" (Evans).

From the Gambia it is reported that one tree yields from three to five cobs per year. A ripe cob, when first cut, weighs from 12 to 23 lbs. The fruit when pulled from the cobs weighs from 8 to 13 lbs., and an imperial bushel of the kernels weighs about 52 lbs" (Sangster).

The full bearing power of a tree in Sierra Leone is given as between its fifteenth to its thirtieth year. Beyond the thirtieth year the amount of oil is said to decrease, but the cobs may increase in size; and the oldest trees may yield a large number of cobs, but very little oil. The accuracy of this information, however, cannot be vouched for (Haddon Smith).

The trees appear to be in flower throughout the year; and as different bunches of fruit ripen at different times, there are always some left on the trees. In the Gambia only one bunch of nuts is said to be ripe at a time. The collecting of the fruits takes place, as a rule, at two regular seasons, the time of which differs in different places according to the climatic conditions, as the following extracts indicate:—

In the Western Province of Southern Nigeria Thompson states that the two regular seasons for fruiting are in the small dry season (August to September), and again from the Harmattan up to about the beginning of the tornadoes, *i.e.*, from the end of December to the middle of March.

"There are two crops, one harvested in the dry season, January to March, and the other between the two rains, *i.e.*, in August. The former crop is the more abundant" (McLeod).

In the Gold Coast "the principal collecting seasons are from May to July, and from November to February, the latter season being said to give the largest percentage of oil" (Evans).

"The natives of the Benin City districts (Southern Nigeria) never remove all the bunches of nuts at any one operation. A bunch is always left on each tree as a kind of 'Ju-ju,' and they assert that if this was not done the tree would soon die. This is an advantage, as seeds are thus provided for natural regeneration, and are scattered about the farms by hornbills, squirrels, &c." (Thompson).

Supplies and Transport.

In the Director's letter to the Under Secretary of State for the Colonies, two questions were asked which are closely connected together:—(*a*) To what extent the existing supplies of Oil Palm kernels are taken advantage of by traders; (*b*) how far increased facilities of communication have tended to increase the quantity of palm oil reported during recent years. From the various reports it is clear that a much greater quantity of fruit is produced than is at present utilised either for local consumption or for the manufacture of oil.

The quantity of kernels or palm oil brought in by the natives seems to depend very largely on the facilities of communication, and wherever such facilities have been improved either by means of railways, improved roads, or by water, an increase in the amount of kernels or palm oil reported has quickly followed.

In Sierra Leone the wastage of fruits appears to be due to the sparseness of the population, but in the other Colonies it is without doubt owing to difficulties of transport.

The Acting Governor of Sierra Leone reports as follows :—

"Traders buy as much palm oil as is brought to them by the natives, and consequently the supply is never equal to the demand. In some parts where the palms are very thick, it is probable that all are not utilised on account of an insufficient population. The District Commissioner of the Panguma district reports that 'there are now sufficient palm trees to meet all possible demands for many years to come.' The District Commissioner of Sherbro states that "the population of the two districts is not sufficient to handle adequately the produce abounding in the country." This shows that the reason why the full benefits are not derived from the existing supply of palm oil and palm kernels is one of sparseness of population but not of want of willing buyers" (Haddon Smith).

From the figures given under the heading 'Exports' it will be seen that the completion of the railway in Sierra Leone has had a marked effect on the export of palm oil and kernels from the Colony.

According to the report from the Gold Coast it appears that only a very small proportion of the Oil Palm products is exported.

"All the palm oil and kernels brought to the various markets are readily purchased by the mercantile community. A quantity of the oil and kernels is utilised by the natives as food and for lubricating purposes, but by far and away the largest quantity is left to decay on the trees. I am inclined to think that not more than one-tenth part of the products of the Oil Palms in this Colony finds its way to the export market.

"The chief reasons why this industry has not been increasing of late years are :—

1st. Low price paid for the products.
2nd. Transport difficulties.
3rd. Lack of machinery.

"In 1883 palm oil realised 2*s.* 6*d.* per gallon ; at the present time it only realises about 9*d.* per gallon regardless of quality. Labour at the present time is about 100 per cent. more expensive than it was 20 years ago, so that although the farmer, at the present time, has to pay twice as much to prepare his product and take it to the market, he only realises about one-third of what he did 20 years ago. The result is that the farmers are leaving the palm oil industry and planting cocoa.

"It requires two carriers to convey the products which one man can produce, so that only one-third of the products that could be grown is grown ; the consequence being that, with the fall in prices of palm oil, the farmer is unable to pay the carriers the same rate of pay, and as the carriers will not work for less, but are asking for

a higher rate of pay, both the farmer and merchant are entirely in the hands of the carriers, and are almost compelled to pay the rates demanded by them; otherwise the produce would never reach the market. The farmer has to give up his Oil Palm industry and turn his attention to products which are more remunerative, and in the Eastern Province at the present time the palm oil and kernel industries are gradually dying out, and this province is one of the finest oil-producing centres in the Colony" (Evans).

In the French Colonies the same story of unused products owing to insufficient means of transport is told; this is particularly the case with regard to the region between the rivers Couffo and Mono in Dahomey where a great part of the products are still lost (Adam).

Northern Nigeria does not appear to export Oil Palm products at all; it is reported that the natives extract the pericarp oil entirely for their own use and, since it does not pay them to carry the kernels any great distance overland to sell, a large quantity are wasted (Shaw).

From Southern Nigeria the tale of the waste of Oil Palm products is repeated, as the two following extracts show.

"It is not possible to state with any degree of accuracy the proportion of a year's crop which is exported by the merchant. There is no doubt that he buys all the natives bring him, and this amount is, in my opinion, a large proportion of the available supply within such areas as are served by easy land and waterways" (McLeod).

"It is not possible to say to what extent existing supplies of kernels are taken advantage of by traders, but there is no doubt that in the Central and Eastern Provinces, enormous quantities never find their way to the seaboard, and are allowed to rot unworked. Judged by the relative out-turn of kernels as compared with oil in the Western Province, and making a liberal allowance for the distant railway traffic included in the Lagos figures, it is estimated that at least 50,000 tons of kernels are lost each year in the central and eastern parts of Southern Nigeria" (Birtwistle).

The principal reason for the present waste of the fruit of the Oil Palm seems to be lack of adequate communication. Mr. Birtwistle makes suggestions as to the ways in which the difficulties may be overcome, and Mr. McLeod points out that the improvement in exports is due to the improved method of transport. This may also be seen from the figures given later. Mr. Birtwistle is of opinion that one of the principal factors to bring about an increase in the production of oil and kernels, if not the main one, is "for the merchants themselves to second the Government's work in rendering water transport easy, by establishing factories nearer the actual producer. Were this done, and free and open trade rendered possible within easy reach of the bush native, I am certain the exports would quickly increase, especially in kernels" (Birtwistle).

"I am of opinion that the yearly expansion of the palm oil and kernel trade of Southern Nigeria is almost entirely due to the opening up of new roads and waterways, and railway extension. A small increase may also be due to the more peaceful state of the country" (McLeod).

Mr. Evans (Gold Coast) concludes his report as follows :—

"With good macadamized roads, suitable for motor traffic, to convey the products to the coast, and cheap light machinery that would satisfactorily manipulate the oil palm fruits, the output of palm oil and kernels from this colony would rapidly increase, but unless these are available I am inclined to think the Oil Palm industry will eventually die out."

The Preparation of the Oil.

Pericarp Oil.—Very little advance appears to have taken place in the mode of preparation of palm oil, and the general quality of the oil produced does not appear to have undergone any marked improvement. Lagos oil still commands the highest price,* though some of the oil from Sierra Leone is said to be of equal quality. Whether the superior character of the Lagos oil is due to the character of the palms or to the method of preparation is not clear, but it would seem advisable that the mode of preparation of the oil should be carefully investigated in order that the best return may be obtained for this product.

In the *Kew Bulletin*, 1892, pp. 204–208, an account is given of the preparation of Lagos palm oil, and it is stated that "every stage in the manufacture . . . is marked by great care and cleanliness, and the result is a remarkably pure sample of oil." The description there given refers only to the Pericarp oil, and corresponds very closely to the reports of the process recently received.

In the Gold Coast the preparation of Pericarp oil is somewhat different from that in vogue at Lagos, and the following interesting account is taken from Mr. Evans' report :—

"Very little progress has been made to improve the process of extracting the oil, the same crude methods of preparation are still carried out, the only noticeable improvement being that the length of time allowed for fermentation has been shortened, and this has a tendency to give the oil a less offensive smell. In some districts iron pots have been substituted for the native clay pots, and this has a tendency to keep the oil purer . . . .

"After the bunches are cut, they are conveyed to the village or preparing pit ; the men cut up the bunches with cutlasses in order to assist the work of picking out the fruit, which is chiefly done by women and children. The nuts, after being picked out, are thrown into a shallow pit (a hole from two to three feet deep, lined with flat stones, and plastered with a compound of palm oil and ashes, the latter prepared by burning plantain leaves) sprinkled with a

---

* "The following were the prices ruling in the Liverpool market at the end of May (1906) :—

	£	s.	d.
Lagos Oil	24	0	0
Calabar (selected)	23	10	0
Bonny/Opobo	23	5	0
Benin	23	0	0
Niger, Brass and New Calabar kinds	22	5	0

"It will be noted that Lagos Oil still heads the list, and realises £1 15s. per ton more than the Niger, Brass, and New Calabar Oils." (Birtwistle).

little water, and covered over with plantain leaves, weighed down by stones and left for about five days.

"During this period a slight fermentation takes place, which softens the fleshy coat of the fruit, and facilitates its easy removal from the nuts, which process is performed by beating the nuts with long wooden pestles. The women and children then take the mixture of pulp and nuts and lay it on a wooden framework placed over another hole, a little water is then sprinkled over it, and the pulpy mass is then covered up with plantain leaves and left for another five days. During this period a quantity of the oil is released, and drains down into the plastered hole; this is then put into old kerosene tins ready for market. This oil is said to be of the very best quality, it has a pleasant smell, and does not readily harden. The nuts are then picked out from the fibre, and placed in the sun to dry. The fibre is put into large iron pots filled with water, and boiled until the oil rises to the surface and is skimmed off. The refuse is then put into a bag, and the remainder of the oil is squeezed out.

"It will be seen that the native method of extracting palm oil is primitive, laborious and wasteful, both of labour and produce, and it is generally affirmed by the natives that the present price of palm oil does not pay them for the large amount of labour entailed in its preparation.

"The following interesting figures, as to the cost of producing palm oil and kernels, have been furnished to me by Konor Mate Kole, of Eastern Krobo, who owns one of the finest palm oil plantations in the Colony.

"Cost of collecting palm nuts and extracting one ton of oil, £11 13*s*. 4*d*.

"Price paid for one ton of oil by local merchants, £10 10*s*.

"Cost of breaking and picking one ton of palm kernels, £10. Price paid for one ton of palm kernels by local merchants, £5 12*s*. The local cost of transport from the plantation—two days' journey from the market—is 1*s*. 6*d*. per day" (Evans).

According to Mr. Dawodu, Assistant Curator, Southern Nigeria, it is the freshness of the nuts more especially that determines the quality of the oil produced, and oil expressed from nuts on the same day as they are picked is the best. For oil used locally this is, of course, possible, but in dealing with large quantities for export without the use of some mill (not yet invented) the nuts have to undergo a short period of fermentation to make the task of extracting the oil easier (McLeod).

In the Eastern Province, Southern Nigeria, according to Mr. Hitchens the collected cones from the three kinds of Oil Palm are not treated alike to ensure the softening and maturation of their drupels preparatory to the extraction of oil from the mesocarp. The drupels of No. 1 (Au-su-ku, soft-shelled nut) are softened and matured on the cones from which the greater number detach themselves and the drupels of Nos. 2 (Okpuorkpu—ordinary variety), and 3 (Af-fiako-jub—the king palm) are detached by hand and fermented in masses to soften. No. 3 is valued by the natives for its large seed (kernel) and not for its scanty supply of oil.

According to the report from Sierra Leone "there has not so far been any improvement by the natives in their methods of extracting

the oil. The oil differs in different parts of the Colony and Protectorate. The merchants state that some of the oil which they get in the district adjoining the railway line is equal to the best quality of Lagos oil and is superior to the Sherbro oil" (Haddon Smith).

In the Gambia the oil is extracted in a manner similar to that in vogue in Lagos.

"Pericarp oil or 'Tulu sayi' in Mandingo, is made as follows and is a dull red :—

"1st. The fruit is plucked from the cob and put into a large pot of water and boiled until the pericarp is loosened from the shell of the nut ; the fruit is then put into a large wooden mortar, or 'Canong,' and worked about with a pestle until the pericarp is separated from the shell.

"2nd. Pericarp is then put into another pot of water and boiled until the oil comes to the surface of the water and the fibre sinks to the bottom.

"3rd. The oil is then separated from the water and is fit for selling.

"The red, or pericarp oil, is sold by the makers in Bathurst in large iron drums each holding 5 gallons, for these they get varying prices ; in the rains and now (June 1908) 12*s*., and during the dry season as much as 18*s*. and £1" (Sangster).

Kernel oil.—The kernels of the Oil Palm fruits are exported for the most part and the oil is extracted from them in Germany, England, and elsewhere. A certain amount of kernel oil is made in West Africa, but the cracking of the shells is a laborious process and the machines which have been invented do not appear to give very satisfactory results, owing to the nuts, not being spherical, passing through them uncracked. In the Gold Coast two machines have been tried by the Government ; in the case of one machine (Gwira), after an experiment with 38 lbs. of dried nuts, 26 lbs. or 68·42 per cent. remained unbroken and 3½ lbs. of kernels were obtained ; on passing the 26 lbs. again through the machine 14½ lbs. of nuts remained unbroken. The other machine (Miller) appears to be somewhat more satisfactory for, after a trial with 2,050 nuts, 392 or 19·12 per cent. remained unbroken. The cost of picking out the kernels by hand is a very expensive part of the process. Since estimating labour at 1*s*. per day it would cost £1 3*s*. 6*d*. to produce 379 lbs. of kernels—the amount yielded by the machine—valued in the local market at 16*s*. From 1*s*. to 3*s*. must be deducted from this amount to pay for transport to place the kernels on the local market (Evans).

It is suggested by Evans that the cost of separating kernels and hulls could be considerably reduced by having a tank partly filled with salt water placed by the machine to catch the kernels and hulls as they fall out, as the kernels would float.

An account of the Miller machine was given in the Annual Report upon the Agricultural Department for 1903, and the following table quoted by Evans is taken from that report.

"The cost of labour in connection with passing 2,050 lbs. of nuts through the machine was 1*s*. 6*d*., and picking out the kernels £1 12*s*.

"The weight of kernels obtained was $3\frac{3}{4}$ cwts. 15 lbs.; while it cost 6*s*. to break by hand and pick sufficient nuts to weigh 56 lbs., as shown below :—

—	Men employed.	Time.	Cost of labour.	Quantity of kernels obtained.
			£ *s*. *d*.	lbs.
Passing 2,050 lbs. nuts through machine.	3	½ day	0 1 6	379
Picking out kernels ...	22	1 day	1 2 0	
Cracking nuts by hand and picking out kernels.	6	1 day	0 6 0	56

"It will thus be seen that with the assistance of the machine a hundredweight of kernels may be prepared for 7*s*. approximately, but when cracked by hand they cost 12*s*., *i.e.*, the cost of labour is reduced 41 per cent."

The ordinary method in use in the Gold Coast for extracting the kernels is, after the nuts are dried, to break them separately with a stone, and to pick out the kernels. The nut-cracking machine is occasionally met with in the Colony, but it has not been taken to kindly by the natives.

In Southern Nigeria kernel oil is extracted by roasting the kernels, and collecting the oil as it oozes out, or by first heating them to a moderate extent only, and then cracking them and placing the broken kernels into water which is boiled, when the oil that floats to the surface is skimmed off and collected (Thompson).

In the Gambia a somewhat different process is resorted to :—

"The oil from the kernel ('Tenkulo tulu' in Mandingo) is whitish.

"1st. The nuts are cracked and kernels extracted.

"2nd. The kernels are then dried in the sun.

"3rd. The kernels are next beaten into flour in a mortar ; and

"4th. The flour thus obtained is mixed up in cold water, and stirred about with a stick until eventually the oil rises to the surface, and is taken off.

"The white oil is generally sold in bottles, for which 9*d*. and 1*s*. per pint bottle is charged. The traders up country pay 1*s*. for 16 lbs. of the kernels.

"This year there are a great many Karoni Jolahs, in Kombo, boiling oil and also selling kernels.

"There is a large sale for the oil both amongst the natives up country and the people of Bathurst, and for this reason the export is not very large" (Sangster).

The following account of the Oil Palm in the Gambia is taken from the third report on the Agricultural and Forest products of the Gambia, by Mr. G. C. Dudgeon, Inspector of Agriculture for British West Africa, published in the Gambia Government Gazette, March 6th, 1909, pp. 124, 125 :—

"This Palm occurs throughout the lower river districts and is utilised by the Mandingos and Jolahs for the extraction of the red fruit or pericarp oil. As the process of extraction in the Gambia

differs somewhat from that employed elsewhere, it may be of interest to describe it here. There are usually three fruiting heads in each season, and there are two seasons in each year, during which the tree bears a crop, that yielded during the wet season being heavier than that of the dry. The weight of a head cut in the dry season may be over 20 lbs., the size having generally been diminished by the previous extraction of Palm Wine from the base of the fruiting stalk. The heads on one tree do not ripen simultaneously. When ripe they are cut down and the fruits are immediately extracted by hand; the head being cut up to facilitate their removal. Winnowing, to get rid of the husk-like covering, with which each fruit is enveloped, is then resorted to, and the clean fruit is placed in a pot to boil until the fibrous pericarp is sufficiently loosened. No decomposition is permitted in order to assist this operation. When the pericarp has swollen, and is therefore more easily detached from the stone, the whole is placed in a mortar and pounded until the kernel stones can be picked out. The remaining pulpy, fibrous liquid is then squeezed through a strainer made from the fan palm leaf, and the liquid resulting is again boiled until the oil rises to the surface and can be skimmed off by means of gourd ladles.

"Kernel oils, both black and white, are said to be prepared by the Mandingos, in a manner which has been described with reference to other West African tribes, but the Jolahs only prepare the kernels for sale in Bathurst, where there is a small trade. All the pericarp oil that is made is consumed in the country.

"On examining the fruits, their small size is particularly noticeable, and the pericarp is very thin. In size those which are examined in Fongi (Jolah country), seemed to be approximately 1 in. by $\frac{4}{5}$ in. by $\frac{1}{2}$ in., and of a bright orange colour, without any black at their apices; but the black-tipped form is said to occur, and the Mandingo trees are said to give a larger fruit. Only one variety is recognised by the natives, the kernel shell of which is very thick, and the native names applied to the tree itself are 'Tengo' (Mandingo), 'Kabekalako' (Jolah), and 'Neul' (Joloff)."

Exports.

It has already been indicated that the supply of palm oil and kernels for export is largely bound up with questions of transport and means of communication. The kernels are imported in some quantity into Liverpool, but the bulk of the carrying trade is in German hands, and the kernels are shipped to Hamburg (Hillier in *K.B.*, 1907, p. 62).

From the statistics published by the various Colonies there appears to have been a marked increase in the export of kernels, but a decrease in some cases in the last year in the export of oil. In Southern Nigeria the following extract represents the present condition of the Oil Palm industry :—

"No definite figures are available to show the extent to which the production of palm produce has been increased owing to improved means of communication, but there is no doubt that the

exports have been expanded by such means. Up to 1904, the export returns published here included oil and kernels from Porto Novo, which were shipped viâ Lagos, so the figures until 1905 cannot fairly be quoted. Since then, however, there has been a very marked increase, as will be seen from the following returns :—

Exports (excluding produce of Dahomey).*

—	Oil.	Kernels.
	Gallons.	Tons.
1905	14,157,384	108,817
1906	16,032,571	113,347
1907	18,332,531	133,630
1908	17,757,137	136,601

"Doubtless the extremely high prices ruling for oil and kernels during the greater part of 1907 afforded the natives an extra inducement to work palm produce more freely than usual, but a large proportion of the increase must be set down to better transport facilities and more settled conditions. There was nothing abnormal about the rainfall of 1906 to account for the large production of 1907, but the climatic conditions may be said to have been not unfavourable" (Birtwistle).

With regard to the Gold Coast, the figures for 1908 are not yet to hand, and the quantity of oil and kernels exported in 1905 is not given in the Colonial Report. The following table, however, shows the position of the industry up to the end of 1907 : —

—	Oil.	Value.	Kernels.	Value.
	Gallons.	£	Tons.	£
1905	—	88,359	—	78,625
1906	2,143,118	125,008	9,355	80,834
1907	1,867,945	119,468	9,753	101,822

Mr. Evans gives some interesting details in his report on the yield of kernels by a tree, and as to the number of trees which would give the present output of oil and kernels from the Colony. His remarks are as follows :—

"The export of palm oil for 1907 was 1,867,945 gallons ; this quantity could be produced by 933,972 trees, covering an area of some thirteen square miles of land, each tree yielding, say, 12,000 nuts, weighing about 160 lbs. Taking the fresh nuts to yield 10 per cent. of oil, this would give about two gallons per tree per annum. The weight of kernels from the same tree would be about 24 lbs.,

* The figures have been taken from the "Government Gazette Extraordinary," Southern Nigeria, No. 46, July, 1908, and Southern Nigeria "Government Gazette," January 20, 1909. An interesting chart, showing the quantity of palm oil and kernels exported from the colony of Lagos from 1896 to 1905, is given in the Col. Rep. Ann., No. 507, Southern Nigeria (Lagos), for 1905.

so that it would take 94 trees to produce one ton of kernels, or 916,782 trees to produce the present export of palm kernels from this Colony."

The report of the Acting-Governor of Sierra Leone is of interest, since the effect of the completion of the railway on the exports of oil and kernels is well seen; to quote from the report :—

"I attach a statement made by the Collector of Customs which gives the quantity of palm oil and palm kernels exported from this Colony in the period preceding the completion of the railway, and also in the period succeeding the completion of the railway. This return clearly indicates that improved facilities of communication have caused an increase in the exports of palm oil and palm kernels." *

Preceding Completion of the Railway.				Succeeding Completion of the Railway.		
——	1903.	1904.	1905.	——	1906.	1907.
Palm kernels ...	Tons. 22,760	Tons. 25,101	Tons. 28,154	Palm kernels	Tons. 30,375	Tons. 34,942
Palm oil ...	Galls. 232,000	Galls. 241,131	Galls. 266,012	Palm oil ...	Galls. 375,573	Galls. 615,997

(Haddon Smith).

The export of both oil and kernels from the Gambia is very small, and, according to the Governor's report, only a small quantity of the oil is used locally, as the natives prefer ground-nut oil. From the figures published in the Colonial Reports, however, it will be seen that there is a continued increase in the quantity of kernels exported. There is no return given for the oil.

Palm Kernels.

——	1904.	1905.	1906.	1907.
Tons ...	179	227	256	342

Palm Wine.

In addition to the palm oil industry, the Oil Palm yields palm wine, which is much appreciated by the natives. The trunk of the palm is tapped by making deep incisions in the upper portion whence spring the leaves. According to a note in *Der Tropenpflanzer* No. 12, 1908, p. 585, the capacity for production of the Oil

* *See* also Col. Rep. Ann., No. 531, 1906, Sierra Leone, p. 15, where the exports from Freetown and Sherbro are set out in detail, and the effect of the railway extension is discussed.

Palm is much diminished by tapping for the wine; 50 to 200 litres of sap may be drawn annually from a single tree and a vigorous palm may yield a daily supply of four litres for two months without intermission. Owing to the constriction of the stem of a tapped palm the top is liable to be blown off in a tornado.

Serious loss of Oil Palm fruits occurs also in the British Colonies. In Southern Nigeria the reports by Mr. Birtwistle and Mr. Thompson refer to the destruction caused by tapping for palm wine. Mr. Evans also reports in the same sense for the Gold Coast.

"One common cause of lessened production in a portion of the Western Province which I have just visited is the collecting of palm wine from the Oil Palm, which renders the tree barren, or practically so. Not content with bleeding a standing tree, the natives of some districts wantonly cut down Oil Palms in order that they more readily obtain a good supply of wine" (Birtwistle).

"In the Oka district of the Onitsha hinterland (Central Province), I have seen the Oil Palm extensively tapped for palm wine and the tree is frequently killed by the process" (Thompson).

"It is very difficult to give with any degree of accuracy the number of palm trees cut down annually for extracting palm wine, but there cannot be many less than 100,000 throughout the Colony and Ashanti.

"In some cases it is beneficial to thin out the trees, they are often too close together, and it can do no harm by cutting out the trees in the semi-open country near the coast. Generally speaking, I do not think there is much damage done through felling trees for palm wine.

"The method for extracting the palm wine is :—

"The tree is felled and allowed to lie on the ground from 3 to 21 days, sometimes longer, but it is generally acknowledged that it gives a very poor yield of palm wine if it is allowed to remain on the ground longer than three weeks before tapping.

"The crown of the palm is cleared of old leaf stalks, and a small hole is made about four inches square. The depth depends upon the thickness of the palm, the whole of the young leaves, which are used as palm cabbage, are cleaned out of this hole, and then another small hole is made inside the square hole, and a reed inserted with the end leading into a vessel to collect the wine. Twice daily the wound is renewed by cutting a small slice in this hole towards the crown of the palm; after about three days a torch, made of the dead leaf-stalks of the palm, is lighted and blown in front of the wound to kill all insects that may have got in the wound.

"The wine continues running from four to six weeks; after that period it is only used for medicinal purposes.

"The quantity of wine given by one palm varies considerably, but the natives state that the greatest quantity given by one tree is about 26 gallons.

"I have, on several occasions, tried to tap the standing trees, but with very poor results, the yield being about one gallon per tree, and the trees afterwards dying" (Evans).

In the third report on the Agricultural and Forest products of the Gambia, by Mr. G. C. Dudgeon, Inspector of Agriculture for

British West Africa (Gambia Government Gazette, March 6th, 1909, p. 125), the following account is given of the extraction of Palm Wine :—

"The extraction of wine from the Oil Palm has probably much to do with the diminutive size of the fruits in the Gambia, and this is practised upon every palm tree in the Jolah country and most of those in the Mandingo. Plantations of small groves or clusters are often seen close to the stockaded villages in Fogni, and it is evident that the palm tree is more valued for the wine than for the oil yielded. The method of extraction is worth notice, owing to the fact that the tree is so carefully treated that it is kept alive for a number of years; which is not the case elsewhere in West Africa. The collector climbs the tree by means of a palm fibre sling, which passes round his waist and encircles the tree. By leaning backward the sling supports his body while he is able to walk up the trunk, pushing the sling upwards as he ascends. The leaves are cut from beneath one of the fruiting heads, to the stem of which is slung a 'bully' or small gourd for the reception of the wine; a hole being then cut with a round-faced chisel below the base of the fruit stem, and the wine conducted into the gourd by means of a funnel made from plaited palm leaves kept in position by a palm thorn. The gourd remains in this position throughout a night, when it is removed, and the hole is deepened before applying a second gourd for another night. This process is continued for five nights, after which the fruit head is cut for making palm oil, and a similar attention is accorded to the next ripening head on the tree. The terminal shoot is not injured, so that although the tree must be greatly weakened from constant tapping it does not die for a considerable time."

The Oil Palm outside West Africa.

The Oil Palm is also found on the N.W. shore of Lake Nyasa, in Zanzibar, and in the Island of Pemba. From the latter place, in 1903, 104,301 lbs. of kernels were exported to the value of £330 and in 1904 the value of the kernels exported was £384 (Cons. Rep. Ann., No. 3263, p. 18, No. 3716, p. 9). Since 1904, however, no returns of palm kernels appear to have been made for the Island of Pemba. The Oil Palm has been introduced into most of the tropical botanical gardens, but except in the case of some plantations in British North Borneo, no efforts appear to have been made to cultivate this palm outside West Africa.

In August last a copy of a despatch from the Governor of Southern Nigeria was received at Kew, through the Secretary of State for the Colonies, in which the suggestion is made that the cultivation of the Oil Palm should be taken up in other Crown Colonies and that Government plantations should be made. In reply to this suggestion it was mentioned that there appeared to be no reason why the Oil Palm should not flourish in such places as British Guiana, Trinidad, East Africa, Ceylon, the Malay Peninsula, &c., provided the conditions of moisture, &c., required by the palm were carefully considered in selecting the site for a plantation. It was also pointed out that, since reports showed that there was at

present a great wastage of Oil Palm products in West Africa and that the industry is capable of much greater development in that region it is somewhat uncertain whether Oil Palm plantations in other Colonies would prove a commercial success.

Moreover, as was pointed out in the former article (*K.B.* No. 2, p. 47), it will be necessary before making extensive plantations in West Africa to learn more about the different varieties of the Oil Palm. It is equally important that plantations should not be made outside West Africa until it is known that the best varieties of the Oil Palm can be raised true from seed.

An account of the ill-fated Oil Palm plantation at Daat, in British North Borneo, is given in the *Bulletin*, 1889, pp. 259–267.

Reports of other plantations in Borneo amongst the Kew records give somewhat conflicting accounts. According to Dr. P. Leys—writing in 1891—the Oil Palms were not a success though grown on especially good soil, and those moved to a higher and damper spot were a still greater failure. The amount of oil produced was small and the heads of fruit much smaller than in West Africa. Dr. Leys arrived at the conclusion that the cultivation of the Oil Palm in Labuan would not pay. This probably refers to the Daat plantation.

According to the Superintendent of Agriculture, British North Borneo (letter, May, 1890), the trees, obtained from seeds supplied by Governor Leys, were only used for ornamental purposes, for though they fruited freely no oil was produced.

From a printed report (1891) of another plantation, however, a different account is given. From a plantation of 40,000 young trees on the Quop estate (Sarawak) it appears that plenty of oil was obtained, but a difficulty was experienced in finding a market for the oil. It would be of interest to know the subsequent history of this plantation.

In a letter of the date November 26, 1891, from Sandakan, N. Borneo, Mr. H. Walker speaks of the "rich growth of African Oil Palm planted in 1882–83 from seed, I believe, obtained from Kew. These are now seeding freely, and must have been doing so for some years, as plants grown from seed produced here are now also bearing." It seems possible that some portion of the failure of these plantations may have been due to seeds of a poor variety of the Oil Palm having been sent to Borneo from West Africa, since in the case of the Quop estate the experiment appears to have been attended with success.

With regard to the Malay Peninsula, Mr. Carruthers, late Director of Agriculture and Government Botanist, Federated Malay States—in a letter of the date January 9, 1909, to the Governor, which has been forwarded to Kew by the courtesy of the Secretary of State for the Colonies—reports that there are 35 specimens of *Elaeis guineensis* in the experimental stations and Botanic Garden, which were raised in 1903 from seed obtained from the Royal Botanic Garden, Ceylon. Mr. Carruthers continues :—

"They average now at six years of age about 12 to 15 ft. in height, but have shown no sign as yet of flowering or fruiting; whether the absence of a dry season and the fact that the trees

never have a dry wind, such as is supposed in West Africa to assist in ripening the fruit, will be a continuous deterrent to the flowering and fruiting of the palms I cannot as yet give any opinion. The Oil Palms here are growing on low-lying and well-watered land, as well as on drier slopes. Until they fruit it is not possible to estimate what crop would be obtainable from each plant, or whether the variety we have is of one which is commercially valuable. . . .

"I am a little doubtful as to the suitability of this cultivation for the native or for the Chinaman. The gathering, the comparatively lengthy process of extraction of the oil, and the tiring nature of these processes will not commend themselves to the Malay, especially when he can by the easier task of cocoanut cultivation probably get as large a monetary return as by growing the oil nut palm. . . .

"The rubber industry is so attractive to the European investor and planter that I do not think the trial of an area of African Oil Palm would attract him unless he were given special rates for this land by Government."

In the Agricultural Bulletin of the Malay States for 1907, pp. 37–40, Mr. Ridley gives a short account of the Oil Palm, with a photograph of a fine example growing in the Botanic Gardens, Singapore. He says: "The tree on good ground here certainly fruits well, but no record has been kept of the weight of fruit produced. Dr. Preuss, when on a visit to the Gardens, expressed surprise at its fertility, and was still more surprised that it was not cultivated largely in a country so well suited to it."

Mr. Ridley expresses the view that it would be well worth while to cultivate the Oil Palm in the Malay Peninsula.

Though there is a considerable amount of evidence to show that the African Oil Palm will flourish in other tropical countries, it is not quite clear whether it would yield a good crop of fruit or prove a commercial success, and any planting which may be done, either in West Africa or in other countries, should in the present state of our knowledge be of an experimental character.

Concluding Remarks.

In conclusion, reverting to the questions put forward by the Director of Kew, it has been shown that:—

(*a*) The existing supplies of Oil Palm kernels are not taken full advantage of by traders in Sierra Leone. The fruits are allowed to go to waste owing to the sparseness of the population, but in the other colonies kernels are not brought into market owing to difficulties of transport.

(*b*) The question of the thin-shelled variety of the Oil Palm has been dealt with in the previous paper, and it has been pointed out that careful experimental work is needed before any extensive planting with the seeds of a particular variety is undertaken.

(*c*) Increased facilities of transport have resulted in an increase in the palm oil and kernel trade, and it is shown in

the reports that wherever railway extension has taken place, or other facilities of transport have been improved, there has been a marked expansion of the Oil Palm industry.

(*d*) As to the quality of the oil produced, very little change has taken place in the methods of preparation. The Lagos oil commands the best price, but there appears to be no reason why oil from other parts should not be of equal value with Lagos oil, since some of the oil from Sierra Leone is said to be of the same quality. It is possible that further improvement could be made to enhance the value of the Lagos product.

(*e*) Little light is thrown on the question as to how far the higher quality of oil from a variety of Oil Palm, the kernels of which may yield a smaller quantity of oil, compensates for the larger quantity that may be yielded by other known varieties, since the natives do not trouble to separate the nuts of the different varieties in extracting the oil, and mainly direct their attention to the oil obtained from the pericarp. It has been shewn that the pericarp in some varieties yields a high percentage of oil as compared with other varieties, but it appears that the trees of these particular varieties are rare. Careful chemical investigation will be required before this question can be answered in a satisfactory manner.

(*f*) The question as to the relative abundance of the varieties has already been answered.

(*g*) With regard to the degree of moisture in the soil, required to ensure a maximum yield of oil, the reports are somewhat conflicting. One point is clearly brought out that the Oil Palm will not grow in a swamp, but that the ground should be moist and well-drained, and the rainfall should be above 50 inches. Although the Oil Palm will grow in damp places and also on well-drained hillsides, statistics are not available to shew the effect on the yield of different situations. The amount of organic matter in the soil is a factor of especial importance for the successful growth of the Oil Palm since the amount of water held in suspension in the soil is largely dependent on the proportion of decaying vegetable matter which it may contain.

(*h*) The country suitable for the successful growth of Oil Palms extends from Sierra Leone to Angola and forms a belt varying from 60 180 miles in breadth, a great deal of land not now covered by palms is suitable for their growth, and it is estimated that about $\frac{3}{4}$ of the territory of Southern Nigeria may afford suitable conditions of moisture &c. for the successful cultivation of the Oil Palm. Outside West Africa, the Malay Peninsula, Borneo and other tropical localities seem to afford the proper conditions for the growth of the palm,

but there is not yet sufficient evidence to justify planting without further experiment.

(*i*) As to the number of seasons during which the Oil Palm maintains a maximum yield reports differ. In some accounts the maximum yield is said to be given when a palm is 10 years old, and in others the age is said to be 12 or 15 years. Again the 10th–20th years are said to be the most prolific period, but more commonly the 15th–30th year is given, though it is also stated that the palms will yield a full crop up to their 150th year. It appears probable, however, that after the 30th year, though the quantity of the fruit does not diminish, the yield of oil is somewhat lessened.

A List of Works on the Oil Palm.

Adam, J. "Le Palmier a huile et le Cocotier en Afrique occidentale française" in L'Agriculture pratique des pays chauds, Bulletin Mensuel du Jardin Colonial, 1908, No. 67, pp. 269–287, No. 68, pp. 380–389; No. 69, pp. 466–475; 1909, No. 70, pp. 35–46, No. 71, pp. 127–158, No. 72, pp. 219–243, to be concluded—with numerous illustrations.

The first paper deals with the habitat of the Oil Palm in the various French West African possessions, the second opens with a general description of the Oil Palm with excellent illustrations of inflorescences and Palms, followed by an account of the varieties of the Oil Palm which is continued in the two following numbers of the Bulletin.

In No. 71 the conditions of vegetation are dealt with and the relation between the rainfall and the yield of the palms is discussed, and it is shewn that the yield of nuts bears some relation to the rainfall of the preceding year.

No. 72 deals with the soil in which the palms flourish, the cultivation of the palms including the formation of the plantations and their maintenance; cultivation of other crops among the palms, and the question of manures. There is also a section dealing with the insect pests of the Oil Palm.

Almeida, J. J. de. "Noticia sobre a Palmeira de Dendem," Lisbonne, 1906; *see* Journal de l'Agriculture Tropicale No. 77, 1907, and 'L'Agriculture des pays chauds,' 1908, p. 466.

Drabble, Dr. E. 'Comparison of Palm Fruits from Various Districts on the West Coast.' Quarterly Journal, Liverpool University Institute of Commercial Research in the Tropics; ii., 1907, pp. 126-129. A short note on the possibilities of the Oil Palm in cultivation, iii., 1908, pp. 15–19.

Evans, A. E. "The African Oil Palm" in 'Tropical Life,' October, 1907, p. 146, with illustrations.

Gruner, Dr. "Die Ölpalme in Bezirk Misahöhe, Togo," in Der Tropenpflanzer, viii., 1904, pp. 283–291. A summary of this paper is given by M. J. Adam in 'L'Agriculture des pays chauds,' 1908, pp. 467, 468.

Hillier, J. M. Economic Notes. Palm Oil and Kernels, in Kew Bulletin, 1907, pp. 61, 62.

Kew Bulletin, 'The Oil Palm in Labuan,' 1889, pp. 262–264. 'The African Oil Palm,' 1891, pp. 190–192, 'Lagos Palm Oil,' 1892, pp. 200–208, with illustrations; 'Economic Plants of Sierra Leone,' Oil Palm, 1893, p. 168.

Köhler. Medizinal Pflanzen, vol. iii., with plate.

Poisson, Jul. & Eug. "Note sur le Palmier à huile de la Côte occidentale d'Afrique," in Bulletin du Museum d'Histoire Naturelle, ix., 1903, pp. 410–415.

Preuss, Dr. Paul. "Die wirtschaftliche Bedeutung der Ölpalme," in Der Tropenpflanzer, vi., 1902, pp. 450–476.

Ridley, H. N. "The Oil Palm," in the Agricultural Bulletin of the Straits and Federated Malay Straits, vi., 1907, pp. 37–40, with plate.

Savariau, N. 'L'Agriculture au Dahomey,' Gouvernment Général de l'Afrique occident. Française, Colonie du Dahomey, 1906, p. 64.

Strunk, Dr. L. "Zur Ölpalmenkultur," in Der Tropenpflanzer, x., 1906, pp. 637–642.

Southern Nigeria Gazette Extraordinary, No. 46, July 3, 1908. Trade report for the year 1907, Export of Palm Oil and Kernels, pp. 919–921.

Thompson, H. N. "Notes on the Oil Palm of Southern Nigeria," in supplement to the Southern Nigeria Government Gazette, No. 10, February 5th, 1908.

XIX.—DIAGNOSES AFRICANAE: XXVIII.

1011. **Pelargonium brevipetalum**, *N. E. Brown* [Geraniaceae]; affine *P. carnoso*, Ait., sed foliis bipinnatis, pedicellis brevissimis et petalis lutescentibus quam sepala brevioribus differt.

Caulis crasso-carnosus, ovoideus, supra terram 4–5 cm. altus, 3 cm. crassus, apice breviter ramosus, glaber. *Folia* laxe subrosulata, 9–19 cm. longa, 4–10 cm. lata, ambitu ovato-oblonga, bipinnatim divisa, crasse carnosa, minutissime subpuberula; pinnae utrinque 5–6, inaequaliter pinnatisectae, pinnulis utrinque 3–4 oblongis sublobatis apice dentatis subtruncatis. *Stipulae* 2 mm. longae et latae, late ovatae, obtusae, herbaceae. *Pedunculus* erectus, 25 cm. longus, superne ramosus, sub lente minutissime subpuberulus, foliis reductis 2–3 distantibus 1–1·8 cm. longis onustus. *Involucri bracteae* 2 mm. longae, ovatae, acutae. *Pedicelli* infra gibbam calycis tubi 3–5 mm. longi, distincte glanduloso-puberuli. *Sepalum* dorsale erectum, 7 mm. longum, 2·5–3 mm. latum, lanceolatum, acutum, viride, basi fusco-purpureo-maculatum; cetera reflexa, aequilonga, immaculata. *Petala* 5, subaequalia, quam sepala breviora, 5 mm. longa, superiora 4 mm., inferiora 3 mm. lata, elliptica, obtusa, pallide lutea. *Stamina* antherifera 5, cum stylo purpurea.

Cape Colony. Laingsburg Div.: near Matjesfontein, *Pillans*. Described from a living plant sent by Mr. Pillans to the Royal Botanic Gardens, Kew, where it flowered in May, 1908.

1012. **Acridocarpus alopecurus**, *Sprague* [Malpighiaceae]; species distinctissima foliis elliptico-lanceolatis inconspicue brunneo-puberulis breviter petiolatis, rhachi inflorescentiae alopecuriformi.

Rami brunnei, striolati, glabrescentes, lenticellosi. *Folia* elliptico-lanceolata, apice breviter acute acuminata, basi obtusa, 10–13 cm. longa, 3·5–5 cm. lata, tenuiter coriacea, utrinque brunneo-puberula pilis exsiccando plerumque delabentibus, venis lateralibus utrinque 7–8 supra inconspicuis subtus satis manifestis, venulis utrinque inconspicuis; petioli 4–5 mm. longi. *Racemi* axillares; pedunculus circiter 1 cm. longus ut rhachis brunneo-pubescens; rhachis alopecuriformis, 1·5–3 cm. longa, circiter 3 mm. diametro paribus glandularum infra bracteas ornata; bracteae late deltoideae, 1 mm. longae, 1·75 mm. latae, pilosae; bracteolae similes et minores; pedicelli sub fructu 1·5–2·3 cm. longi, brunneo-pubescentes. *Mericarpia* 1–2 evoluta, 1 cm. longa, 6–7 mm. lata; ala ambitu naviculiformis, 4·5–5 cm. longa, 1·7–2 cm. lata.

Tropical East Africa. Pemba Island, *Miss Barraud*.

A. alopecurus runs down beside *A. chloropterus* and *A. katangensis* in the key (Journ. Bot. 1906, p. 201); but its real affinities are uncertain. From the shape of the bracts and the presence of glands on the rhachis it might be placed in the second group (p. 199), but apart from these characters it has but little in common with *A. Smeathmanni* and *A. congolensis*.

1013. **Indigofera stenophylla**, *Guill. et Perr.* var. **ampla**, *Sprague* [Leguminosae-Galegeae]; a typo et a var. *macrocarpa* foliolis latioribus, calyce grossius hirsuto, alis latioribus inferne densius villosis recedit; a var. *brachypoda* indumento grossiore, foliolis paucioribus longioribus, racemis longioribus distinguitur; a var. *Nyassae* caulibus hirsutis, foliolis latioribus, calyce patule hirsuto differt.

Rami validiusculi, leviter flexuosi, angulati, subappresse hirsuti. *Folia* 10–15 cm. longa, 2–3-juga. *Foliola* anguste oblongo-oblanceolata, apice obtusa vel rotundata, mucronata, 3–6 cm. longa, 7–14 mm. lata, discoloria. *Racemi* usque ad 13 cm. longi, floribus post anthesin deflexis. *Calyx* extra patule castaneo-hirsutus, pilis usque ad 1 mm. longis (in typo ad 0·5 mm. longis); tubus vix 1 mm. longus; lobi postici 3 mm. longi, anticus 5–6 mm. longus, laterales intermedii. *Petala* rubra (*Dodd*); vexillum suborbiculare, leviter retusum vel truncatum, cuspidatulum, 5·5–6 mm. longum, 4–4·5 mm. latum; alae 7 mm. longae, 2·5 mm. latae, extra inferne dense villosae; carina ut in typo. *Legumina* 4·5–5 cm. longa, 3·5 mm. lata.

Lagos. On the road to Abeokuta, *Millen*, 69; without locality, *Dawodu*, 290; Ogbomosho, *Bailey's Collector*, 3; in the dry zone, *Dodd*, 427.

The Lagos plant is here treated as a variety of *I. stenophylla* for the sake of uniformity with E. G. Baker's memoir on the Indigoferas of Tropical Africa (Journ. Bot., 1903, p. 260). *I. stenophylla* might, however, equally well be restricted to the type

and var. *macrocarpa*, and the three other varieties, *brachypoda*, *Nyassae* and *ampla*, could then be treated as distinct species.

1014. **Olea macrocarpa**, *C. H. Wright* [Oleaceae-Oleineae]; *O. laurifoliae*, Lam., affinis, foliis longe petiolatis fructuque oblongo recedit.

Rami teretes, tenues, cinerei, lenticellis instructi. *Folia* lanceolata, utrinque attenuata, 5 cm. longa, 12 mm. lata, supra nitida, obscure viridia, subtus pallidiora, minute punctata, glabra, ad margines incrassata revolutaque; petioli 8 mm. longi, supra canaliculati, subtus verrucosi. *Paniculi* ad ramorum apices terminales, multiflori, 4 cm. diam. *Calyx* cupularis, 2 mm. diam., breviter obtuseque 4-dentatus, ad margines puberulus. *Corolla* calyce ter longior; lobi oblongi, obtusi, apice cucullati. *Fructus* oblongus, 1·8 cm. longus, 8 mm. diam.

Transvaal. Zoutpansberg, "*D.F.O.*" 4829; forest near Pilgrim's Rest, *Grenfell*, 869.

1015. **Glossochilus parviflorus**, *Hutchinson* [Acanthaceae-Justicieae]; affinis *G. Burchellii*, Nees, sed foliis lanceolatis, calycis segmentis brevioribus, corollis minoribus differt.

Suffruticulus parvus, ramosissimus. *Rami* quadrangulares, pilis reflexis. *Folia* oblongo-lanceolata, acuta, basi attenuata, 1–1·5 cm. longa, 2–4 mm. lata, crassa, ciliata venis utrinque inconspicuis. *Calycis* segmenta 5, subaequalia, lineari-lanceolata, subacuta, 3·5 mm. longa, basi 0·5 mm. lata, 3-nervia, extra breviter glanduloso-pilosa, intus glabra. *Corolla* oblique infundibuliformis, superne leviter dilatata, 8 mm. longa, fauce circiter 3 mm. diametro, reticulata, lobis rotundatis subaequalibus. *Stamina* 4, inclusa; antherae 1 mm. longae, loculis subaequalibus, uno altius affixo, basi mucronatis. *Ovarium* ambitu oblongo-ovoideum, 2 mm. longum, 1 mm. diametro, superne parce longe pilosum; stylus 3 mm. longus, glaber, ramis brevissimis rotundatis. *Fructus* breviter stipitatus, ambitu oblongus, utrinque attenuatus, 2 cm. longus, 3 mm. diametro, puberulus. *Semina* compressa, crassiuscula, rugosa.

Transvaal. Piet Potgeiter's Rest, *R. Leendertz*, 1265.

1016. **Oxygonum fasciculatum**, *C. H. Wright* [Polygonaceae-Eupolygoneae]; *O. salicifolio*, Dammer, proximum, staminibus inclusis fructuque glabro recedit.

Caules ascendentes, rubescentes, leviter puberuli. *Folia* lanceolata, acuminata, 5 cm. longa, 10 mm. lata, basi attenuata, utrinque papillosa, integerrima; petioli 6 mm. longi, tenues; ochreae cylindricae, 8 mm. longae, membranaceae, setis pluribus tenuibus brunneis tubo paullo brevioribus instructae. *Racemi* terminales, ad 25 cm. longi; bracteae cuspidatae, setisque circa duabus lateralibus instructae; pedicelli bracteis paullo longiores, 2–3-natim dispositi. *Perianthium* campanulatum; tubus brevissimus; lobi 4 mm. longi, oblongi, obtusi. *Stamina* 3 mm. longa; filamenta tria interiora basi dilatata. *Stylus* staminibus brevior, ad medium divisus; stigmata subcapitata. *Fructus* triqueter, glaber, spinis tribus infra medium armatus.

Tropical Africa. Nile Land: British East Africa, Gilgil River, 1800–2100 m., *Scott-Elliot*, 6651; Ngomeni, in shallow sand,

Scott-Elliot, 6265. Mozambique District: German East Africa east shore of Lake Tanganyika, *Scott-Elliot*, 8322.

1017. **Oxygonum pubescens**, *C. H. Wright* [Polygonaceae-Eupolygoneae]; *O. delagoensi*, O. Kuntze, affine, fructu obovoideo 9-costato differt.

Caules ascendentes, 15–30 cm. alti, 2 mm. diametro, leviter sulcati, ad nodos vix incrassati, minute pubescentes; ochreae 4 mm. longae, setis tubo aequilongis. *Folia* linearia, 2·5 cm. longa, 1 mm. lata, acuta, puberula. *Racemi* laxi, 12·5 cm. longi; bracteae companulatae, cuspidatae, esetosae; flores 2–3-natim fasciculati; pedicelli bracteis longiores. *Perianthium* dilute luteum, campanulatum, 6 mm. longum, extra puberulum; lobi ovati, obtusi, 3 mm. longi. *Stamina* inclusa; filamenta 1·5 mm. longa; antherae coeruleae. *Fructus* obovoideus, 9-costatus, obscure puberulus; costae venis transversis connexae.

Tropical Africa. Mozambique District: Portuguese East Africa; Morebane Chara, 760 m., *Johnson*, 247. Rhodesia; Mashonaland, between Salisbury and Headlands, *Hon. Mrs. Evelyn Cecil*, 155; at Umtali, *Hon. Mrs. Evelyn Cecil*, 235A; between Umtali and Salisbury, *Hon. Mrs. Evelyn Cecil*, 44.

This species is allied to the South African *O. Dregeanum*, Meisn., which has perfectly glabrous stems and usually broader leaves.

1018. **Polygonum Schinzii**, *C. H. Wright* [Polygonaceae-Eupolygoneae]; *P. limbato*, Meisn., affine, foliis glabrescentibus bracteisque eciliatis differt.

Caulis robustus, glaber. *Folia* oblongo-lanceolata, basi apiceque acuminata, primum hispida, demum (costis exceptis) glabrescentia, 11·5 cm. longa, 2·5 cm. lata, marginibus undulatis; petioli 12 mm. longi; ochreae membranaceae, plus minusve campanulatae, primum hirsutae, demum glabrescentes, limbo herbaceo patenti instructae. *Racemi* axillares, saepius 3-natim dispositi, densiflori; bracteae dilute roseae, late ovatae, obtusae, eciliatae, 3 mm. longae; pedicelli bracteis aequilongi. *Perianthium* 4 mm. longum, infra medium 5-lobatum; lobi oblongi, apice rotundati. *Stamina* 7, perianthio paullo breviora. *Ovarium* compressum: styli usque ad medium conjuncti; stigmata subcapitata. *Nuculi* compresso-trigoni.

Tropical Africa. German South-west Africa: Amboland, Olukunda, *Schinz*, 499.

1019. **Rumex Woodii**, *N. E. Brown* [Polygonaceae]; affinis *R. cordato*, Desf., sed foliis lanceolatis basi acutis et fructibus majoribus facile distinguitur.

Herba 30–70 cm. alta. *Folia* radicalia cum petiolo 8–16 cm. longa, 1–4·5 cm. lata, lineari-lanceolata, lanceolata, elliptico-lanceolata, vel interdum hastato-lanceolata vel ovata, acuta vel obtusa, basi cuneato- vel attenuato-acuta, glabra; caulina gradatim minora; stipulae membranaceae, integrae, truncatae, 8–15 mm. longae. *Panicula* 7–20 cm. longa, aphylla, ubique glabra, ramis suberectis. *Flores* dioici. *Pedicelli* 4–9 mm. longi, filiformes, infra medium articulati. *Perianthii fructiferi* segmenta exteriora reflexa, 2·5–3 mm. longa, lineari-lanceolata, acuta, concava; interiora erecta, 11–17 mm. longa, 9–14 mm. lata, elliptico- vel orbiculato-cordata, obtusa, integra,

membranaceo-scariosa, reticulato-venosa, etuberculata, sed basi ad sinum callo parvo reflexo truncato vel obtuso instructa. *Achaenium* acute vel subalato-trigonum, laeve, brunneum, faciebus lanceolatis subacuminatis.

South Africa. Natal: Itafaman, *Wood*, 644; near Lambonjiva River, 4000 ft., *Wood*, 3583. Transvaal: north and south of Carolina in sandy soil, 5800 ft., *Burtt Davy*, 2714; Ermelo Experimental Farm, 5575 ft., *Burtt Davy*, 3919; Wemmers Hoek, Lydenburg, 5400 ft., *Burtt Davy*, 7625.

This species is also allied to the North American *R. hymenosepalus*, Torr., but is less stout, with smaller leaves, and the venation of the fruiting sepals is entirely different. As in the case of *R. cordatus*, Desf. the root of *R. Woodii* may be tuberous; its leaves and stems are often marked with bright red or scarlet patches formed of minute papillae, caused by a minute mite, probably some species of *Eriophyes*.

1020. **Coelocaryon oxycarpum**, *Stapf* [Myristicaceae]; fructu acuto a speciebus caeteris distinctum.

Arbor ramulis glabris teretibus. *Folia* obovato oblonga vel oblonga, acuminata, basi obtusa, 10–15 cm. longa, 5–6 cm. lata, tenuiter coriacea, in gemmis rufo-pubescentia, citissime glabrata, nervis lateralibus utrinque 6–8, petiolo 12–18 mm. longo flexuoso. *Racemi* umbellarum mascularum graciles, 3–5 cm. longi, ramis infimis 4–6 mm. longis, receptaculo discoideo 2–4 mm. diametro 10–25 flores gerente, pedicellis tenuibus ad 4 mm. longis. *Perianthium* 3-fidum, 1·5 mm. longum. *Antherae* 3, 0·3 mm. longae, stipiti aequilongae. *Flores* foeminei ignoti. *Infructescentiae* ex axillis foliorum summorum ortae, 5–8·5 cm. longae, glabrae; umbellae solitariae vel paucae in racemos dispositae, fructus 2–3 tantum maturantes, pedicellis subtenuibus 1–1·2 cm. longis. *Perianthium* persistens, 3-partitum, fere 2 mm. longum. *Fructus* ovoideo-oblongus vel ellipsoideo-oblongus, basi angustior, acutus vel subacutus, 2·5–3 cm. longus, pericarpio tenui glabro. *Semen* ellipsoideo-oblongum, testa brunnea laevi, endospermate fere ad centrum ruminato.

West Africa. French Guinea: Farana, in gallery woods, *Chevalier*, 13178, 13425.

XX.—PEGLERA AND NECTAROPETALUM.

O. Stapf and L. A. Boodle.

The genus *Peglera* was described by Dr. H. Bolus in the *Kew Bulletin* for 1907, p. 362, and placed near *Weihea* and *Cassipourea* in *Rhizophoraceae*. A figure of it was subsequently published in *Hooker's Icones Plantarum*, t. 2841. In the accompanying text it was pointed out that Dr. Bolus was not quite satisfied that he had correctly placed it, and that closer examination indicated relationships with *Irvingia* (*Simarubaceae*). Mr. Boodle at the same time stated that although the anatomy of *Peglera* agreed in some respects with that of the *Simarubaceae*, it differed in others.

Whilst the plate and letterpress for *Peglera* were prepared for the *Icones Plantarum*, I independently dealt with *Nectaropetalum Kaessneri*, which had also been selected for publication in the *Icones*. The two plates were accidentally placed next one another in the volume. It was then discovered, but too late for correction, that the figures of *Peglera capensis* and *Nectaropetalum Kaessneri* were so similar as to suggest that the species figured under those names were actually congeneric. Further examination left no doubt on that point, and *Peglera capensis* becomes now *Nectaropetalum capense*. *Nectaropetalum*, originally described by Engler as a genus of *Linaceae*, was transferred (*Icones Plantarum*, t. 2840) to *Erythroxylaceae*, an order not previously taken into consideration by Mr. Boodle in connection with *Peglera*. He extended, therefore, his comparative studies of the *Peglera* material to *Nectaropetalum* and the *Erythroxylaceae*, with the result that the generic identity of *Peglera* and *Nectaropetalum* and their place in *Erythroxylaceae* may now be considered as well established. Mr. Boodle's account is given below, whilst a revised description of *Nectaropetalum* and a clavis of the species is added here as a summary of our present knowledge of the genus.

Nectaropetalum, *Engl.* in Engl. Jahrb. vol. xxxii, p. 109 (emend.). *Erythroxylo* affine, sed ovario 2-loculari, stylo simplice stigmata 2 recurva gerente, petalorum squamis maxime reductis vel plane obsoletis et filamentorum tubo brevi vel brevissimo distinctum.

Calyx 5-(rarius 4-) partitus ; segmenta triangularia, acuta, praeter margines crassiuscula, valvata (?). *Petala* 5-(rarius 4-) unguiculata, calyce pluries longiora, lamina ima basi squamula biloba minuta cum ea foveolam formante instructa vel nuda, sed ab ungue textura distincta. *Stamina* petalorum numero duplo basi in tubum brevem vel annulum connata ; filamenta episepala breviora, epipetala longiora ; antherae dorso infra medium affixae. *Ovarium* ovoideum, 2-loculare ; ovula solitaria, ab apice pendula, raphe axiscopa ; stylus simplex, antheras superans ; stigmata 2, brevia, ovata, recurva. *Fructus* ignotus. *Frutices* vel arbusculae, ramis novellis basi cataphyllis (ramentis vel perulis) deciduis paucis obtectis. *Folia* papyracea vel subcoriacea, integra : stipulae intrapetiolares connatae (vel demum fissae ?), scariosae, sub 2-carinatae, acutae, longitudinaliter striatae. *Flores* axillares, solitarii vel pauci fasciculati, brevissime pedicellati, ut videtur albidi vel florescentes.

Species 3, in East and South Africa from Mombasa (Bome River), to the Kentani District in Transkei, Cape Colony.

* Petala 3 cm. longa, ad laminae basin fovea instructa ... ... 1. *N. Carvalhoi*

Petala 0·7–1·3 cm. longa.

Folia magis minusve elliptica, obtusa vel subacuta ; petala ad laminae basin squama biloba instructa, quam stamina longiora ; filamenta basi in tubum brevem connata... 2. *N. Kaessneri.*

Folia utrinque acuta vel apice acutissima ; petala nuda, quam stamina breviora, filamenta ima basi in annulum connata ... 3. *N. capense*

Following the diagnosis of *Peglera capensis* and the remarks on the systematic position of this species in the *Kew Bulletin* (1907, pp. 362–3), a short description of the anatomical structure of the plant was given, and a comparison was made with the anatomical characters of the *Legnotideae (Rhizophoraceae)* and the *Simarubaceae*. The conclusion arrived at was that the genus *Peglera* "would find a more natural place in the *Simarubaceae* than in the *Legnotideae*."

A comparison has now been made between *Peglera capensis* and *Nectaropetalum Kaessneri*, and the agreement of the anatomy in these two plants proves to be sufficiently marked to establish a fairly close affinity between them.

The re-examination of *Peglera*, for the purpose of this comparison, has led to the detection of two characters, which had been overlooked at the time when the previous anatomical description of the genus was written. One of these is the presence of occasional scalariform perforations in the vessels, simple perforations being general in the wood, and those of the scalariform rare. The other character is the occurrence of cortical vascular bundles which, however, are restricted to a small portion of the internode just below the node.

The agreement between *P. capensis* and *N. Kaessneri* extends to most of the lesser anatomical details, while of the points of difference the chief are as follows: vascular system of midrib slightly simpler in *Nectaropetalum*; papillae on the lower epidermis of the leaf in *Nectaropetalum* but not in *Peglera*; cortical bundles extending throughout the internode in *Nectaropetalum*, but occurring only near the top of the internode in *Peglera*. The first two differences are quite unimportant, and the third, though considerable (*see below*), is one that would not be very surprising if found within the limits of a genus.

In *Nectaropetalum* two vascular bundles separate from the stele in the upper part of the internode and pass upwards, as cortical bundles, through the node and the next internode. They reach the second node, where apparently* each of them forks into two, one branch going to the leaf-trace, and one to the stipule. It follows that there are two cortical bundles in the lower part of an internode, and four in the upper part. Thus the behaviour of the cortical bundles is similar to that of the cortical bundles in *Erythroxylon*, except that in that genus, according to Van Tieghem,† the cortical bundles originate in the lower, instead of the upper, portion of the internode, and stop at the next node, instead of the next but one. In *Erythroxylon emarginatum*, Schum. et Th.,‡ the two cortical bundles originate practically at the node, but one or both may separate from the stele just before or just after the two cortical bundles from the node below pass out of the stem.§ Hence, as

---

* The material examined was insufficient for determining the relation of the cortical bundles to the stipules, &c., with certainty.

† Van Tieghem, Struct. et affin. des Erythroxylacées, Bull. Mus. d'hist. nat., ix. (1903), p. 289.

‡ Specimen from Namasi, leg. Cameron, No. 3.

§ In this case it was determined with certainty that each of these two bundles forks at the node, giving a small branch for the stipule, and a larger bundle, which fuses with one end of the median leaf-trace, as described by Van Tieghem.

regards the cortical bundles, this species forms a connecting link between *Nectaropetalum Kaessneri* and the species of *Erythroxylon* investigated by Van Tieghem. In *Peglera* four cortical bundles pass out separately from the vascular ring in the upper part of the internode, and stop at the next node, where they apparently behave in the same way as the four bundles due to sub-division of the two cortical bundles of *Erythroxylon*.

On account of the presence of cortical bundles in *Peglera* and *Nectaropetalum* (and especially the behaviour of these bundles in the latter genus), and the general agreement with the *Erythroxyluceae* * shown by the anatomy of the stem and leaf, there can be little doubt that these two genera belong to that family.

XXI.—NOTES ON THE INDIAN SPECIES OF SAMBUCUS.

J. Hutchinson.

Recent enquiries received at Kew regarding the occurrence of *Sambucus Ebulus*, Linn., in India have rendered it necessary to re-examine the Indian specimens referred to that species by the late Mr. C. B. Clarke and others.

In 1890 Dr. R. von Wettstein described a new species of *Sambucus* from the Himalaya under the name of *S. Gautschii* and referred to it the whole of the Kashmir material mentioned by Clarke under *S. Ebulus*. His description was drawn up from plants, raised in the Botanic Garden of the Vienna University, from seeds distributed by the Saharanpur Botanic Garden in 1886. Dr. von Wettstein was no doubt right in distinguishing this *Sambucus* from *S. Ebulus*, for the latter evidently does not occur in India at all; but he appears to have overlooked *S. Wightiana*, Wall. apud Wight and Arnott, a fairly good description of which is given in Wight and Arnott's Prodromus, p. 388; or he may have been misled by Clarke's identification of *S. Wightiana* with *S. javanica*. From an examination of the type specimen of *S. Wightiana* in Wallich's herbarium at the Linnean Society, consisting of a fruiting specimen, there is little doubt as to its identity with Clarke's "*S. Ebulus*" and Wettstein's *S. Gautschii*, and as *S. Wightiana* is much the earlier name it should in future be employed for the Kashmir plant. Unfortunately, however, there is some uncertainty about the origin of the type specimen of *S. Wightiana*. Wallich in the Catalogue (no. 6303), as well as on the label, quoted merely Hb. Wight, whilst Wight in his Catalogue (no. 1252) and in Wight and Arnott l.c. refers to Wallich. From the fact that the plant was taken up by Wight and Arnott in their Prodromus, it might be inferred that their specimen was from the

---

* Van Tieghem, l. c.; Solereder, Systematic Anatomy (*Erythroxylon* &c., under *Linaceae*), Eng. Ed., pp. 159, 847. The leaves of *Erythroxylon emarginatum* differ only in unimportant characters from those of *Peglera* and *Nectaropetalum*. The midrib is practically the same as in *Peglera*, and there are no epidermal papillae.

Peninsula; but there is no other record of *Sambucus* occurring there. At the same time the specimen which Wight and Arnott mention as being in their possession and which might have some note concerning its origin attached to it is neither at Kew nor in the Arnott herbarium at Glasgow and is probably lost.

S. Ebulus is characterised by having erect stamens with purple anthers and somewhat large flowers; whereas in *S. Wightiana* the stamens are spreading with yellow anthers and the flowers much smaller.

S. Wightiana is more closely allied to *S. adnata* Wall. from which it differs, however, in the glabrous or almost glabrous inflorescence, and, moreover, it is so far only known from Kashmir and Chitral, whilst *S. adnata* in India is confined to Nepal and Sikkim, extending in Tibet to Chumbi and to Western China. It appears therefore advisable to regard them at present as distinct species.

Short differential diagnoses of *S. Ebulus* and of the Indian species are given below.

S. Ebulus, *Linn.*

Herbaceous; stems thick, dying down in winter. Stipules foliaceous. Leaflets in 4–6 pairs, the lower ones usually stalked, teeth not tapering into long points. Primary branches of the inflorescence 3, stout, glabrescent, leafy at the base. Flowers about 1 cm. in diameter, tinged with red. Stamens erect; filaments dilated; anthers purple. Fruits black.

Distribution:—Europe, northward to Sweden and the middle of Russia; Madeira and North West Africa; eastward to Northern Persia.

S. Wightiana, *Wall.* ex Wight & Arnott, Prodr. p. 388 (1834).

S. Ebulus, Clarke in Hook. Fl. Brit. Ind. vol. iii. p. 2; non Linn.; *S. Gautschii*, Wettst. in Oest. Bot. Zeitschr. vol. xl. p. 230, t. 2 (1890). Herbaceous; stems as in *S. Ebulus*. Stipules foliaceous. Leaflets in 3–4 pairs, the two upper pairs often adnate at the base and decurrent, the lower ones sessile or shortly stalked, teeth tapering into fine points. Primary branches of the inflorescence 5, glabrous or sparingly and minutely papillose, not leafy at the base. Flowers at most 5 mm. in diameter, whitish-yellow or lemon yellow* (according to a coloured drawing by Royle and Carey in the Kew coll.). Calyx segments glabrous. Stamens spreading; filaments not dilated; anthers yellow. Fruits at first red, becoming black at maturity.

Distribution:—Chitral: Shandar Province, *Giles*, 650! Kashmir: Sonamarg, 8500 ft. *Clarke*, 30903! Sind Valley, *Thomson!* *Henderson!* Kishtwar, 8000–9000 ft., *Thomson!* without precise locality, *Falconer!* Punjab: Chamba, Pangi Valley, *Ellis*, 3472! without locality, *Wallich*, 6303!

Duthie, in a report on a botanical tour in Kashmir (Records Bot. Survey of India, vol. i., n.i., p. 43), mentions this plant (as *S. Ebulus*) as being a common weed near villages in the Sind, Liddar, and other valleys of Kashmir.

---

* Lawrence in his account of the Valley of Kashmir p. 92, gives the flowers as being white.

S. adnata, *Wall.* ex DC. Prodr. vol. iv. p. 322 (1830).

A shrub 3–6 feet high. Stipules small or much reduced. Leaflets in 3–5 pairs, otherwise as in *S. Wightiana* except that the teeth are not so much produced. Primary branches of the inflorescence 3–5, densely pubescent, usually leafy at the base. Flowers white, nearly 5 mm. in diameter. Calyx segments pubescent. Stamens as in *S. Wightiana*. Fruits red or yellowish-red.

Distribution :—Nepal : Gossain Than, *Wallich*, 482 ! Tambur river, berries red like currants, *Hooker !* Sikkim : Lachung Valley, 6000–10000 ft., *Hooker !* Phullaloong, Darjeeling, *Clarke*, 12681 ! *Gamble*, 96 D.! Tibet : Chumbi, *Dungboo*, 4533 ! Yatung, *Hobson !* Yunnan : in woods at La-long-tan, *Delavay*, 3781 ! Nantyen and Momien, *Anderson !* Szechuen : Tachienlu, *Pratt*, 122 ! *Hosie !*

S. javanica, *Bl.*, Bijd. p. 657.

S. rubra, Ham. Wall. Cat. 482 b.

This differs chiefly from the two preceding species in having free leaflets, wider, subthyrsoid inflorescences, sessile or subsessile flowers, and black fruits. Further, it is described as a large, virgate shrub or small tree.

Distribution :—Sikkim : Lebong, leaves boiled in hot water and used for injuries, *Hooker !* Upper Assam : Sadiya, *Griffith*, 769 ! without precise locality, *Jenkins*, 498 ! Khasia Hills : below Nunklao, *Hooker & Thomson*, 1625 ! Nurtiang, berries small and black, *Hooker & Thomson !* Bengal : Gongachora (near Rungpur), *Hamilton* in Hb. Wallich, 482 B ! Dacca (cultivated) 'same as wild in Mymensingh', *Clarke*, 7650 !

Occurs also in Sumatra, Java, and the Philippines.

Clarke identified *S. chinensis*, Lindley with this species, but to the writer it appears to be distinct. Lindley describes it as "a rank, weedy, herbaceous plant, with the aspect of *S. Ebulus*," characters which could not be applied to *S. javanica*.

XXII.—MISCELLANEOUS NOTES.

Mr. A. Osborn, Foreman in the Decorative Department, has been transferred to the Arboretum as Foreman in succession to Mr. W. Dallimore, promoted to an Assistantship [*K. B.*, 1909, p. 150.] The vacancy in the Decorative Department has been filled by the appointment of Mr. J. Coutts, who entered Kew as a young gardener in 1896 and who, after a period of service as sub-foreman at Kew, has since 1900 filled the position of head gardener to Sir T. Dyke Acland, Bart., at Killerton Park, Devonshire.

Sir George King.—Subjoined is a list of works by the late Sir George King, K.C.I.E., LL.D., F.R.S., in continuation of the notice which appeared in the present volume of the *Bulletin*, No. 2, pp. 68–72.

Notes on the lion of Aboo. (Proc. As. Soc. Bengal, 1868, pp. 198–200.)

On the birds of the Goona district. (Journ. As. Soc. Bengal, 1868, vol. xxxvii., pp. 208–218.)

Notes on the famine foods of Marwar. (Proc. As. Soc. Bengal, 1869, pp. 116–121.—Reprinted in Trans. Bot. Soc. Edinburgh, 1870, vol. x., pp. 239–245.)

The cultivation and extraction of China-grass-cloth or Rheea fibre. (Journ. Agric. and Hortic. Soc. India, 1869, n.s. vol. i., sect. 1, pp. 400–411.)

Indian Economic Botany and Gardening; a review. (Calcutta Review, 1869, vol. xlix., pp. 187–205.)

Notes of vegetable products used as food during the late famine in Rajpootana. (Trans. Bot. Soc. Edinburgh, 1870, vol. x., p. 198.)

Report on the Dehra Dhoon Forests. Allahabad 1871. 15 pp.

Report on Forest Conservancy, etc., for Raneekhet. (Gazette of India for 1871, Supplement n. 34, pp. 1222–1231.)

Remarks on the pruning of Tea. (Journ. Agric. and Hortic. Soc. India, 1871, n.s., vol. iii., sect. 1, pp. 82–98.)

Annual Reports of the Royal Botanic Garden, Calcutta, Nos. [85, 87–89], 90–100, 102–109. 1872, 1874–87, 1889–97. (Report for the year 1886–87 reprinted in Journ. Agric. and Hortic. Soc. India, 1888, n.s., vol. iii., sect. A., pp. 25–33.)

History of the introduction of the medicinal Ipecacuanha plant into Bengal. (Journ. Agric. and Hortic. Soc. India, 1874, n.s., vol. v., sect. 1, pp. 46–48.)

Annual Report on the [Government] Cinchona Plantations [and Factory] in British Sikkim, Nos. 12–25, 27–29, 31–35. 1874–87, 1889–91, 1893–97.

Forest Flora of North-West and Central India, by J. L. Stewart, completed by D. Brandis; a review. (Indian Forester, 1875, vol i., pp. 180–186.)

Directions for drying specimens of plants for a herbarium. Calcutta (Bengal Secretariat Press), 1875. 4 pp.

Botany. [List of the plants of the plains of the N.W. Provinces.] (E. T. Atkinson, Gazetteer of the N.W. Provinces and Oude, 1876, vol. iv., pp. 57–73.—List separately reprinted as Plants of the N.W. Provinces, pp. 1–20.)

A manual of Cinchona cultivation in India. Calcutta, 1876. Second edition, Calcutta, 1880.

Note on a sport in *Paritium tricuspe*, G. Don. (Journ. Linn. Soc., 1876, vol. xv., pp. 101–103.)

List of the principal plants growing in the Bengal Presidency and Assam. (By G. King and S. Kurz.) (W. W. Hunter, A statistical account of Bengal, 1877, vol. xx., pp. 121–127.)

A glossary of Indian plants mentioned in Sanskrit medical works with Bengali, Hindi and Latin synonyms. (U. C. Dutt, The Materia Medica of the Hindus. Calcutta, 1877.—Rev. ed. id., 1900, pp. 289–324.)

On the source of the winged Cardamom of Nepal. (Journ. Linn. Soc., 1878, vol. xvii., pp. 3–5.)

Sketch of the Flora of Rajputana. Calcutta (Government Central Press), 1878, 12 pp. (Reprinted in Indian Forester, 1879, vol. iv., pp. 226–236.)

Cinchona cultivation in Java. Indian Forester, 1880, vol. v., pp. 422–428.)

Directions for sowing *Pithecolobium Saman* seed, and for treating the young plants. (Journ. Agric. and Hortic. Soc. India, 1881, n.s., vol. vi., sect. 1, p. 256.)

List of the plants of Garhwál, Jaunsár-Báwar and the Dehra Dún. (E. T. Atkinson, Gazetteer of the N.W. Provinces and Oude, 1882, vol. x., Himalayan Districts, vol. i., pp. 299–322.)

On three new Himalayan Primulas. (Journ. As. Soc. Bengal, 1886, vol. lv., pp. 227–228, tt. 8–10.)

On two new species of *Ilex* from the Eastern Himalaya. (Journ. As. Soc. Bengal, 1886, vol. lv., pp. 265–266, tt. 13–14.)

On the fertilization of *Ficus hispida*: a problem in Vegetable Physiology. (Sc. Mem. Med. Off. Army of India, 1886, part 2, pp. 47–52, tt. 9–10.)

Observations on the genus *Ficus*, with special reference to the Indo-Malayan and Chinese species. (Journ. Linn. Soc. 1887, vol. xxiv., pp. 27–44.)

On some new species of *Ficus* from New Guinea. (Journ. As. Soc. Bengal, 1887, vol. lv., pp. 394–411.)

A second series of new species of *Ficus* from New Guinea. (Journ. As. Soc. Bengal, 1887, vol. lvi., pp. 61–65.)

On some new species of *Ficus* from Sumatra. (Journ. As. Soc. Bengal, 1887, vol. lvi., pp. 65–67.)

On the species of *Loranthus* indigenous to Perak. (Journ. As. Soc. Bengal, 1887, vol. lvi., pp. 89–100.)

The species of *Ficus* of the Indo-Malayan and Chinese countries. (Ann. Roy. Bot. Gard. Calcutta, 1888, vol. i., pp. 1–185, tt. 1–225.)

Urticaceae: Ficus. (Flora of British India, vol. v., pp. 494–537: 1888.)

Some new species of *Ficus* from New Guinea. (Ann. Roy. Bot. Gard. Calcutta, 1889, vol. i., Appendix, pp. 1–51, tt. 1–5.)

The species of *Artocarpus* indigenous to British India. (Ann. Roy. Bot. Gard. Calcutta, 1889, vol. ii., pp. 1–16, tt. 1–14.)

The Indo-Malayan species of *Quercus* and *Castanopsis*. (Ann. Roy. Bot. Gard. Calcutta, 1889, vol. ii., pp. 17–107, tt. 15–104.)

Materials for a Flora of the Malayan Peninsula. Prefatory note. (Proc. As. Soc. Bengal, 1889, pp. 185–186.) Nos. 1–13. *Ranunculaceae–Cornaceae*. (Journ. As. Soc. Bengal, 1889, vol. lviii., pp. 359–408; 1890, vol. lix., pp. 113–206; 1891, vol. lx., pp. 38–140; 1892, vol. lxi., pp. 1–130; 1893, vol. lxii., pp. 87–137; 1894, vol. lxii., pp. 189–262; 1895, vol. lxiv., pp. 16–137; 1896, vol. lxv., pp. 339–516; 1897, vol. lxvi., pp. 1–345; 1898, vol. lxvii., pp. 1–63; 1900, vol. lxix., pp. 1–87; 1901, lxx., pp. 66–142; 1902, vol. lxxi.,

pp. 46–80.) [(By G. King and J. S. Gamble), 14–21. *Caprifoliaceae–Verbenaceae.* (l.c., 1904, vol. lxxii., pp. 111–229; 1904, vol. lxxiii., pp. 47–135; 1905, vol. lxxiv., pp. 1–386; 1907, vol. lxxiv., pp. 387–728; 1908, vol. lxxiv., pp. 729–916.)

The *Magnoliaceae* of British India. (Ann. Roy. Bot. Gard. Calcutta, 1891, vol. iii., pp. 197–223, tt. 38–74.)

The species of *Myristica* of British India. (Ann. Roy. Bot. Gard. Calcutta, 1891, vol. iii., pp. 275–331, tt. 106–174.)

A short account of Colonel Kyd, the founder of the Royal Botanic Garden, Calcutta. (Ann. Roy. Gard. Calcutta, 1893, vol. iv., pp. 1–11, Frontisp.)

The *Anonaceae* of British India. (Ann. Roy. Gard. Calcutta, 1893, vol. iv., pp. 1–169, tt. 1–220.)

Reports of the Botanical Survey of India for the years 1892–93, 1893–94, 1894–95, 1895–96, 1896–97. Simla, 1893–97.

On some Indian species of *Canarium*. (Journ. As. Soc. Bengal, 1894. vol. lxii., pp. 184–188, tt. 10–13.)

Descriptions of two new species of *Cinchona*. (Sc. Mem. Med. Off. Army of India, 1894, part 8, pp. 59–61, tt. 1–2.)

A guide to the Royal Botanic Garden, Calcutta. Calcutta, 1895, iv. and 32 pp.

A brief memoir of William Roxburgh, author of the "Flora Indica." (Ann. Roy. Bot. Gard. Calcutta, 1895, vol. v., pp. 1–9, Frontisp.)

On a new species of *Renanthera*. (By G. King and D. Prain.) (Journ. As. Soc. Bengal, 1896, vol. lxiv., p. 328.)

On some new Orchids from Sikkim. (By G. King and R. Pantling.) (Journ. As. Soc. Bengal, 1896, vol. lxiv., pp. 329–344.)

Notes on the Indian species of *Vitis*, Linn. (Journ As. Soc. Bengal, 1896, vol. lxv., pp. 108–114.)

Descriptions of some new Indian trees. (Journ. As. Soc. Bengal, 1896, vol. lxv., pp. 114–117.)

A second series of new Orchids from Sikkim. (By G. King and R. Pantling.) (Journ. As. Soc. Bengal, 1896, vol. lxv., pp. 118–134.)

On *Croftia*, a new Indo-Chinese genus of *Scitamineae*. (By G. King and and D. Prain.) (Journ. As. Soc. Bengal, 1896, vol. lxv., pp. 297–299, t. 9.)

A century of new and rare Indian plants. (By G. King and P. Brühl.) (Ann. Roy. Bot. Gard. Calcutta, 1896, vol. v., pp. 71–170, tt. 102–200.)

Some new Indo-Malayan Orchids. (By G. King and R. Pantling.) (Journ. As. Soc. Bengal, 1897, vol. lxvi., pp. 578–605.)

The Orchids of the Sikkim-Himalaya. (By G. King and R. Pantling.) (Ann. Roy. Bot. Gard. Calcutta, 1898, vol. viii., pp. 1–342, tt. 1–448.)

Descriptions of some new plants from the North-Eastern-frontiers of India. (By G. King and D. Prain.) (Journ. As. Soc. Bengal, 1898, vol. lxvii., pp. 284–305.)

The early history of Indian Botany. (Journ. Bot., 1899, vol. xxxvii., pp. 454–463.)

A sketch of the history of Indian Botany. (Address to the Botanical Section of the British Association for the Advancement of Science, Dover. 1899.)

George Dickie [in Aberdeen University Appreciations.] Aberdeen (Aurora Borealis Academica, 1899, pp. 326–335.)

A second century of new and rare Indian Plants. (By G. King, J. F. Duthie, and D. Prain.) (Ann. Roy. Bot. Gard. Calcutta, 1901, vol. ix., pp. 1–80. tt. 1–93.)

The Flora of the Presidency of Bombay, by T. Cooke, pt. 1; a review. (Journ. Bot. 1901, vol. xxxix., pp. 392–393.)

Flora Simlensis, by Sir H. Collett; a review. (Gard. Chron., 1903, 3rd ser., vol. xxxiii., pp. 117–118.)

Presentations to Museums.—Franco-British Exhibition. In addition to the products received from this Exhibition, recorded in *Kew Bulletin*, 1908, pp. 457, 458, the following have since been received.—New South Wales section. Plants of *Xanthorrhœa arborea*, *X. hastilis*, *Triodia irritans*, *Hakea acicularia*, *H. gibbosa*, also a flowering spike of Giant-Lily (*Doryanthes excelsa*), &c. These were presented by Mr. J. H. Maiden, F.L.S., Director, Botanic Gardens, Sydney. From the Indian Section per Mr. B. J. Rose, a collection of raw vegetable products including samples of Cotton, Jute, Sisal Hemp, also 9 logs of Andaman timbers and a series of models illustrating Agriculture in India.

The following other miscellaneous specimens have also been recently presented to the Museums:—

Messrs. Howard Bros. Chesham. Specimens to illustrate the manufacture of butter prints and wooden spoons.

Mrs. Eustace Smith, Lyndhurst. Water-colour drawing of a Giant Tasmanian Lily (*Doryanthes excelsa*) which flowered in a garden in Algeria six or seven years ago.

Mr. R. S. Lynch, Cambridge. Earthen pot as used in the collection of Turpentine from *Pinus Pinaster* in the forests of the Gironde.

Mr. F. W. Jackson, District Commissioner, Northern Territories, Gold Coast. Specimens to illustrate the manufacture of fibre and cordage from *Hibiscus cannabinus*. These were exhibited at the Kumasi Agricultural Show and were presented at the request of Mr. A. E. Evans of the Botanical and Agricultural Dept., Gold Coast.

Mr. A. E. Bernays, Kew. Bowl of tobacco pipe formed of the fruit of a species of *Eucalyptus*, Queensland.

Mr. T. Wilkinson, Rochdale. Board of figured Pitch Pine.

Mr. A. E. Evans, Botanical and Agricultural Dept., Gold Coast. Samples of rubber from *Funtumia elastica*, coagulated with the juice of a vine known as "Diecha," Coomassie.

Mrs. Duff, North Walsham. Branch of *Eucalyptus coccifera* from a tree 10 years old.

Mr. S. T. Dunn, F.L.S., Superintendent, Botanical and Forestry Dept., Hong Kong. Sandals and clogs made partially of the sheaths of *Phyllostachys Quilloi*, also specimens of the sheaths, from Japan, and ropes and cables of various dimensions, made of Bamboo, generally used on Chinese junks.

Mr. H. W. Hilliard, Ealing. Portion of stem of a species of *Populus* bitten out by beavers, Minnedosa, Manitoba.

Dr. Treub, Director of the Dept. of Agriculture, Buitenzorg, Java. A collection of photographs of Gutta and of Rubber plantations, Tjipetir, Java.

Assistant Director, Kew. Plant of *Nototriche turritella* and photograph of the plant in its native habitat, from the slopes of El Misti, near Arequipa, Peru, alt. 13000–15000 ft., collected by the donor March, 1903.

J. M. H.

Erythrina ovalifolia.—This tree, which had not hitherto been recorded further west than Ceylon, is represented in a small collection of herbarium specimens from Pemba Island (near Zanzibar), which is 40° further to the west, and separated by a stretch of ocean over 2,500 miles wide. It had, however, previously been collected on the Comoro Islands by Hildebrandt and Humblot, but the specimens had remained unidentified.

When the habitat of *E. ovalifolia* and its mode of seed dispersal are taken into consideration, the great extension of the known area of distribution offers no serious difficulties. It is a prickly tree, 30–50 ft. high, with wide-spreading branches. In Pemba and the Comoro Islands it occurs in swamps on the sea-shore; in Ceylon, according to Trimen,* it is rather common in low country, by the banks of rivers and streams; in Burma, according to Kurz,* it is common in the tidal forests and tidal savannahs, and also in the beach jungles; and in Samoa, and the Fiji and Tonga Islands it appears to be confined to the littoral region. In New Caledonia, however, it has been collected on the mountains, according to Zahlbruckner; and in Java, where it occurs almost exclusively on the banks of streams, pools and morasses, it is found at various elevations up to 2,300 ft., although most frequent in the low plains.

An interesting question, which at once suggests itself, is whether *E. ovalifolia* was originally a littoral plant which has spread inland, or an inland plant which has spread to the littoral region. Guppy, who has studied similar cases in the Pacific, is of opinion that the purely littoral stage was the first, but the facts as to *E. ovalifolia* suggest an inland origin for that species. If it commenced as a littoral, why should it have penetrated inland only in Java and New Caledonia? Assuming it to have originated inland, however, and to have spread to the sea-shore, the small inland area and the very much greater range of littoral distribution are what might be expected.

---

* The references to *E. ovalifolia* are given at the end of the note.

There is abundant evidence in support of the dispersal of species of *Erythrina* by ocean currents, and in the case of *E. indica* and *E. ovalifolia* the evidence is particularly striking. In 1883 the islands of the Krakatau group, situated in the Straits of Sunda, were the scene of the most violent volcanic explosion of historic times, which completely destroyed the original vegetation, burying it beneath a thick pall of glowing ashes. Treub, who visited them three years later, found seedlings of nine species of phanerogams growing on the drift zone of the beach, among which was an *Erythrina*. All had presumably grown from seeds or fruits cast up by the waves. Penzig, who investigated the vegetation in 1897, found both *Erythrina indica* and *E. ovalifolia* among the plants which had established themselves on the beach.

Guppy,* who has investigated the question of plant distribution in the Pacific, divides the seeds and fruits which are distributed by ocean currents into three groups (1) where the floating power is derived from unoccupied space in the cavity of the seed or fruit, no part of the seed or fruit possessing independent floating power; (2) where the floating power is due mainly or entirely to buoyant kernels; (3) where it is due to the presence of air-bearing tissue in the seed-coats or wall of the fruit. The seeds of *Erythrina indica* and *E. ovalifolia* belong to the second group.

Full references and a summary of the distribution of *E. ovalifolia* may be found useful.

ERYTHRINA OVALIFOLIA, Roxb. Fl. Ind. vol. iii., 1832, p. 254; Wight, Ic. t. 247; Benth. in. Mig. Pl. Jungh. p. 237; Mig. Fl. Ned. Ind. vol. i. p. 207; Seem. Fl. Viti. p. 60; Baker in Fl. Brit. Ind. vol. ii. p. 189; Kurz, For. Fl. vol. i. pp. xvi. 367; Zahlbruckner in Ann. Hofmus. Wien, vol. iii. p. 277; Trimen, Fl. Ceylon, vol. ii. p. 64; Schimper, Indo-mal. Strandfl. pp. 120, 165 Boerl. in Teysmannia, 1892, p. 535; Koord. et Valet. in Meded.'s Lands Plantent. No. xiv. p. 70; Hemsl. in Journ. Linn. Soc. Bot. vol. xxx. p. 174; King, Materials, vol. iii. p. 72; Perkins, Frag. Fl. Philipp. vol. i. p. 85; Merrill in Philipp. Gov. Lab. Publ. No. xxvii. p. 39; Ernst, Fl. Krakatau, p. 41.

E. fusca, Lour. Fl. Cochinch. 1790, p. 427, fide Koord. et Valet, l. c.

E. picta, Blanco, Fl. Filip. ed. 1, 1837, p. 565, non Linn.

E. caffra, Blanco, Fl. Filip. ed. 2, 1845, p. 394, non Thunb.

Duchassaingea ovalifolia, Walp. in Linnaea, vol. xxiii. 1850, p. 742; Hassk. Hort. Bogor, p. 192.

Gelala aquatica, Rumph. Amb. vol. ii. t. 78.

INDIA. Bengal, Sylhet, Assam, Burma, Malay Peninsula, Ceylon. MALAYA. Siam, Java, Sumatra, Philippines. POLYNESIA. Samoa, Fiji and Tonga Islands, New Caledonia. TROPICAL AFRICA. Pemba Island. MASCARENE ISLANDS. Comoro Islands.

E. fusca, Lour. takes priority over *E. ovalifolia* if Koorders and Valeton are correct in making them synonymous.

T. A. S.

---

* Observations of a Naturalist in the Pacific, vol. ii., Plant Dispersal.

Seeds of Cycnoches chlorochilon.—In March, 1896, a seed capsule of *Cycnoches chlorochilon*, Klotzsch, was obtained from Messrs. Hugh Low and Co. for preservation. It was fully developed, and had been cut from a recently imported plant. A drawing was made, after which the capsule was cut longitudinally for convenience of drying, and the number of seeds proved so enormous that they were submitted to Dr. Scott, then Honorary Keeper of the Jodrell Laboratory with a view of ascertaining their approximate number. The report was as follows :—

"I find the number of seeds in the capsule of *Cycnoches chlorochilon* to be about $3\frac{3}{4}$ millions.

"The result was arrived at as follows :

Total weight of seeds in paper	...	...	18·60 grammes.
Total weight of paper alone ...	...	...	4·75 „
Total weight of seeds...	...	...	13·85 „
Weight of two coverslips with about 300 seeds			0·2275 „
Weight of two coverslips alone	...	...	0·2264 „
Weight of about 300 seeds	...	...	0·0011 „

"Thus we get a proportion sum :

$$\cdot0011 : 13\cdot85 : : 300 : x.$$

$$x. = \frac{13\cdot85 \times 300}{\cdot0011} = \frac{4155}{\cdot0011} = \frac{41550000}{11} = 3{,}770{,}000 \text{ approximately.}$$

"This is itself only a rough approximation and as you said some seeds had been lost in opening the capsule you might take the total number at about four millions. In other words the progeny of this single flower, if all the seeds came up, would be about equal to the population of London.

"The weight of each seed works out to the very minute figure of ·0000036 grammes. About 300,000 seeds to the gramme (very roughly)".

This is much in excess of figures previously recorded for orchid capsules. Darwin estimated the number of seeds in a capsule of *Orchis maculata* as about 6,200, and Mr. J. Scott, of the Royal Botanic Garden, Edinburgh, calculated the number in a capsule of *Acropera* as 371,250, while F. Mueller informed Darwin that he found about 1,758,440 seeds in the capsule of a *Maxillaria* in South Brazil. The seeds weighed $42\frac{1}{2}$ grains, and he estimated the number by arranging half a grain of seed in a narrow line, and then counting a measured length. He adds that the same plant sometimes produces half a dozen capsules. It may be added that the capsule of *Cycnoches chlorochilon* under notice measured six inches long by two inches broad. The sexes are separate and the female flowers so far as known are solitary, but the males are borne several together in a raceme.

R. A. R.

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 5.] [1909.

XXIII.—MAKRUSS OR ZIMBITI.

(*Androstachys Johnsonii*, Prain.)

In an article on Inhambane Copal (*Kew Bulletin*, 1888, p. 281) reference was made to the communication of specimens by Lt. H. E. O'Neill, H.M.'s Consul for Mozambique, which led to the identification of *Copaifera Gorskiana*, Benth., as the botanical source of this product. Along with the samples of the leaves and bark of this species, sent under Consul O'Neill's despatch, dated 14 February, 1883, were communicated specimens of a second species, referred to in the following terms :—"(2) a few twigs with leaf and seed of the tree called in Mozambique 'Makruss,' the timber of which is impervious to the ravages of the white ant and has a considerable local value." Mr. O'Neill's despatch further states :—" I believe it is the timber produced by this tree that Mr. Lasdell, Timber Inspector of H.M.'s Navy, reported [upon] so favourably in 1859," and hazards the belief that the wood might prove to be of considerable local value, stating also that the tree abounds in the Mosembe district, north of Mozambique.

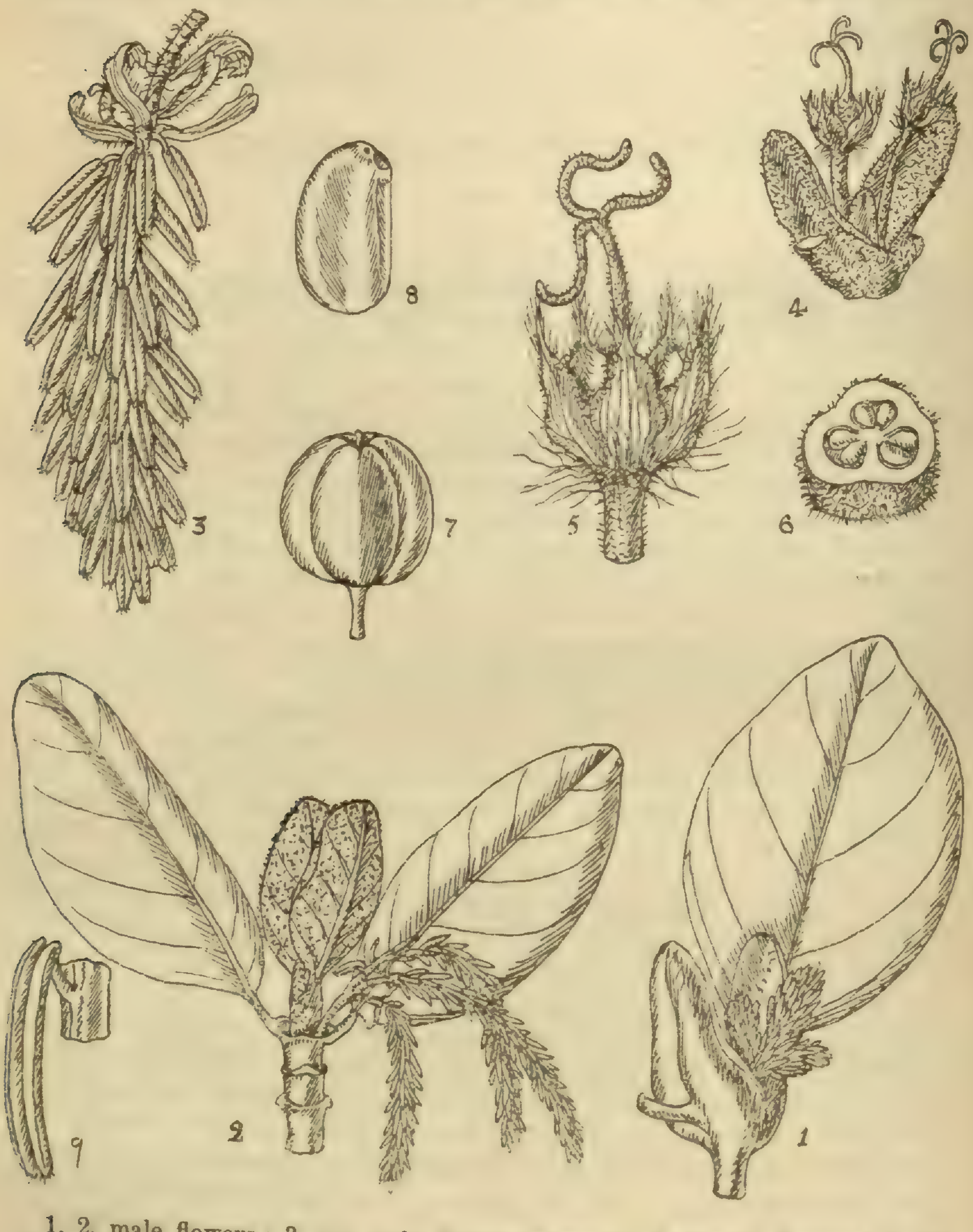
The specimens, which were examined by Professor Oliver, showed that "Makruss" belongs to the natural family *Euphorbiaceae*, evidently to an undescribed genus which could not be fully characterised in the absence of male flowers. The following report was made to H.M.'s Secretary of State for Foreign Affairs on 9 April, 1883 :—" With regard to the 'Makruss' tree, Professor Oliver is of opinion that it is entirely new to science. Like African oak it belongs to the family *Euphorbiaceae*, but it is quite distinct from that. It would be quite worth while for Consul O'Neill to prepare a special report upon this tree and its timber. The tree produces two kinds of flowers, and Consul O'Neill's specimens were only of one kind. It would be desirable for its more complete study that he should transmit to England further and more complete specimens prepared according to the directions given in the circular which I had the honour to enclose in my last letter relating to the Copal."

Further reference was made to this timber in subsequent correspondence between Kew and Consul O'Neill, but no additional material reached Kew till 22 September, 1908, when specimens

(13192—6a.) Wt. 108—471. 1375. 6/09. D & S.

in fruit and specimens with male flowers were received from Mr. W. H. Johnson of the Companhia de Moçambique. The note accompanying these specimens states that the species is a "large hard-wooded tree, common near streams in low country." The specimens actually sent were collected near Beira where the name applied to the tree is not 'Makruss' but 'Zimbiti.' The specimens sent by Mr. Johnson have enabled an examination to be made of the male flowers, which are of a somewhat unusual nature. The necessary technical descriptions of the new genus and species have already been published in this work (*K. B.* 1908, pp. 438, 439).

The general facies of the material is suggestive of the *Buxaceae* as perhaps its natural position, and there was nothing in Consul



1, 2, male flowers; 3, one male flower, *enlarged;* 4, female flowers; 5, one female flower, *enlarged;* 6, section of ovary, *much enlarged;* 7, fruit; 8, seed, *enlarged;* 9, single stamen from lower part of axis, showing recurved filament, *much enlarged.*

O'Neill's material to contradict this legitimate surmise. The ripe seeds sent by Mr. Johnson show, however, that the raphe is ventral and not dorsal, and indicate that in spite of its somewhat unusual appearance the species should better be referred to the *Phyllantheae*. In the female flowers there is no unusual feature to record; the perianth is 5-partite with ovate, acuminate, imbricate lobes, while the ovary is 3-celled with two ovules in each cell, and the styles are connate in an elongated column with three reflexed stigmas. The male flowers are, however, sufficiently striking and remarkable. These are ternate in each axil with their peduncles now almost completely fused, now free nearly to the base, the lateral flowers being slightly smaller than the central. Towards the apex of the peduncles are found in the central flower usually 5, in the lateral flowers generally only 2–3 spirally arranged, bract-like perianth-segments quite free from each other. The central axis of the flower is prolonged as a slender catkin-like spike along which the elongated anthers are spirally disposed; the lowest anthers have very short, but distinct, abruptly recurved filaments, the others being sessile; they are distinctly 2-celled, the cells being adnate to the connective and dehiscing throughout their length.

In connection with the study of the species Mr. L. A. Boodle very kindly undertook a careful examination of the anatomy of this somewhat singular plant and has supplied the following note :— "The anatomical structure of the stem and leaf of *Androstachys Johnsonii* was examined in order to see what indications it would give with regard to systematic position. Among the anatomical characters of this species are the following :—sclerenchymatous fibres are present in the mesophyll of the leaf; in the stem there is a special hypoderm of about three layers of cells having thick walls which finally become lignified; the periderm arises just below the hypoderm, *i.e.*, in about the fourth layer below the epidermis; there is a continuous ring composed of fibres and sclerotic cells in the pericycle."

All these are characters that do not favour affinity with the *Buxaceae*, while all of them are characters that are quite satisfactory for an Euphorbiaceous species. A microscopic examination of the stamen and seed respectively showed that there is no articulation of the filament and that the raphe is certainly ventral.

Mr. W. H. Johnson has further very kindly supplied the following note with regard to the "Zimbiti Timber Tree."

"Although abundant in the low country of the Manica and Sofala Territories the Zimbiti tree only appears to flourish on the banks of streams or adjacent thereto, and in such situations 90 per cent. of the arborescent vegetation is composed of it. Many of these trees have their trunks submerged to a height of 4 or 5 feet when the streams are swollen by the rains. The trunk of mature trees is frequently 6 feet in circumference and unbranched up to a height of 40 feet. The bark is flaky and silvery grey in colour; this, together with the white downy coating on the under surface of the leaves and young leaf-buds and the characteristically poplar-like habit of the tree, render it a most conspicuous object, even at comparatively long distances.

"The colour of the sap-wood is white and that of the heart-wood a dull brown. The latter is rich in resin, and when burned gives off a fragrant odour resembling frankincense.

"The sap-wood, which in mature trees is a negligible quantity, is subject to attacks both by white ants and boring beetles, but the heart wood is impervious to all such insects. Owing to its great strength and durability this timber is invaluable for bridge and house piles and is generally employed locally for both these purposes. Although hard and heavy it can be readily sawn into planks which are admirably adapted for verandah floors, steps, and similar constructions which are constantly exposed to climatic influences."

XXIV.—FUNGI EXOTICI: IX.

G. Massee.

Until quite recently, in dealing with the general distribution of fungi, it was considered that the fleshy, perishable forms included in such genera as *Boletus*, *Agaricus*, *Hydnum*, &c., were characteristic of, and mostly confined to, the north temperate zone, whereas dry, cartilaginous, or corky forms, represented by species of *Polystictus*, *Hexagona*, *Stereum*, &c., were equally characteristic of tropical regions. We now know that this generalisation is incorrect, and was simply founded on the fact that the dry coriaceous species of fungi, requiring no attention in the way of drying, were collected by most botanists in the tropics; whereas the fleshy species, difficult to preserve under the most favourable of conditions, were systematically ignored.

The species of *Boletus*, being exceptionally fleshy and prone to decay, are practically unknown from tropical countries. The first African species, *B. curtipes*, Massee, was described in this Journal only last year. The present batch of species were all collected in the Botanic Gardens, Singapore, very beautifully coloured figures of each being made by Mr. C. G. de Alwis, and the specimens were preserved in spirit.

Twenty-two figures of species of *Boletus* were made from specimens collected in the gardens, and all these, judging from the figures, are well-marked, undescribed species. The condition of the spirit material in a few cases, however, did not enable a full diagnosis to be drawn up, but the fact of twenty species of *Boletus* occurring in such a limited area as that indicated proves that the most fleshy of fungi are well represented in tropical regions.

Polyporaceae.

Boletus rufo-aureus, *Massee*.

Pileus globoso-pulvinatus, quandoque subumbonatus, carnosus, glaber, rufo-aureus, centrum versus fuscescens, margine involutus, levis, undulatus vel lobatus, 5 cm. latus. *Tubuli* stipiti adnati, brevissimi, flavescentes; pori minutissimi, rotundati, aureo-rufescentes. *Stipes* sursum incrassatus, solidus, pileo concolor, subsquamulosus vel maculis saturatioribus variegatus, basi pallidus, 7 cm.

longus, 2 cm. crassus. *Sporae* cylindrico-fusiformae, flavo-rubiginosae, 10 × 4·5 μ. *Caro* compacta, albida, 1·5 cm. crassa.

SINGAPORE. On the ground, *Ridley*, 61, ser. 2.

A brilliantly coloured fungus, remarkable for the very short tubes (1–2 mm.) and the very minute, rounded pores. The pileus in some specimens has a suggestion of an umbo. Not closely allied to any published species, but showing affinity in some respects with *Boletus spadiceus*, Schaeffer.

Boletus altissimus, *Massee*.

Pileus conico-convexus, dein pulvinatus, glaber, aetate alveolatus, rufo-brunneus margine albido, 7–8 cm. latus. *Tubuli* subliberi, elongati, flavo-virentes ; pori magni, polygoni vel flexuoso-oblongi, griseo-virides. *Stipes* solidus, aequalis, basi incurvatus, glaber, albo-brunneus, 24–28 cm. longus, 1 cm. crassus ; annulus cortiniformis, superus. *Sporae* fusiformae, fuliginosae, 7–8 × 4 μ. *Caro* compacta, albida, 1 cm. crassa, versus marginem tenuissima.

SINGAPORE. On the ground, *Ridley*, 9, ser. 2.

A peculiar fungus, remarkable for the very long, equal, slender stem, bearing near the apex a cortinate ring or annulus. Not closely allied to any known species, but may be placed in the vicinity of *Boletus bovinus*, Fries.

Boletus bicolor, *Massee*.

Pileus pulvinatus, dein plus minusve depresso-undulatus, glaber, siccus, aurantiacus centro obscuriore, 5–6 cm. latus. *Tubuli* stipiti adnati vel subdecurrentes, albidi, 3–4 mm. longi ; pori elongato-hexagoni, ampli, albidi. *Stipes* farctus, solidus, sursum incrassatus, glaber, pileo concolor, 4–5 cm. longus, sursum 1 cm. crassus. *Sporae* fusiformae, albidae, flavo-tinctae, 7–8 × 4 μ. *Caro* spongiosa, albida, 1–1·5 cm. crassa.

SINGAPORE. On the ground, *Ridley*, 56, ser. 2.

Readily distinguished by the orange-coloured pileus and stem and the white pores. Allied to *Boletus versipellis*, Fries.

Boletus umbilicatus, *Massee*.

Pileus convexus, profunde umbilicatus, siccus, glaber, flavido-roseus, costis pallidis anastomosantibus eximie reticulatus, margine albidus, 4–6 cm. latus. *Tubuli* elongati, stipiti adnati vel subdecurrentes, flavo-virentes ; pori maximi, angulati, virescentes. *Stipes* solidus, sursum leviter incrassatus, longitudinaliter striatus, pileo concolor, 6–7 cm. longus, 1 cm. crassus, subinde subflexuosus. *Sporae* fusiformae, viridi-flavescentes, 8–9 × 5 μ. *Caro* compacta, albida, 1·5 cm. crassa.

SINGAPORE. On the ground, *Ridley*, 78, ser. 2.

A very distinct and interesting species, remarkable alike for the deeply umbilicate pileus, a character unique in the genus, so far as at present known ; the pileus ornamented with raised ribs, anastomosing to form an irregular network ; and in the tufted habit of growth. Approaching *Boletus caespitosus*, Massee, in habit ; differing in the longer tubes and very large, angular pores.

Boletus Alwisii, *Massee*.

Pileus carnosus, compactus, pulvinatus, glaber, flavidus centro saturatiore, margine albido infractus, 3–4 cm. latus. *Tubuli* breves,

stipiti adnati, flavescentes; pori parvi, subrotundi, flavidi, tactu virescentes. *Stipes* solidus, deorsum attenuatus, pileo concolor vel pallidior, supra annulum reticulatus, infra concentrice squamulosus, 5–6 cm. longus, 0·5 cm. crassus. *Sporae* oblongo-fusoideae, subhyalinae, 6–7 × 4 μ. *Caro* albida, 0·5 cm. crassa, versus marginem tenuissima.

SINGAPORE. On the ground, *Ridley*, 42 & 95, ser. 2.

A very beautiful little *Boletus*, of a clear yellow colour throughout, belonging to the section including *Boletus luteus*, L., and *B. flavus*, With. The illustration indicates that *B. Alwisii* is gregarious in habit.

Boletus tristiculus, *Massee*.

Pileus convexo-explanatus, undulatus, siccus, pulverulentus, margine lobatus, griseo-lividus, 8–9 cm. latus. *Tubuli* concolores, elongati, circa stipitem profunde depressi; pori angulati, ampli, griseo–rufescentes. *Stipes* solidus, elongatus, sursum attenuatus, supra annulum obsoletum pallidus, reticulatusque, infra subsquamulosus squamulis compressis, 8–9 cm. longus, 2–3 cm. crassus. *Sporae* fusiformae, pallidae, 8–9 × 4·5 μ. *Caro* compacta, albida, fracta subcinerascens, 1·5 cm. crassa.

SINGAPORE. On the ground, *Ridley*, 80, ser. 2.

A somewhat dingy-looking fungus, the prevailing colour being a livid grey. Allied in structure to *Boletus chrysenteron*, Fries.

Boletus albellus, *Massee*.

Pileus pulvinatus, carnosus, expanso-depressus vel undulatus, siccus, glaber, albus, 8–10 cm. latus. *Tubuli* albido-flavi, liberi; pori concolores, angulati vel sinuato-oblongi, ampli. *Stipes* farctus, subaequalis vel leviter basi incrassatus, concolor, undique reticulatus, maculis flavescentibus variegatus, 8–9 cm. longus, 2–3 cm. crassus. *Sporae* fusiformae, pallide flavo-virides, uniguttulatae, 10–12 × 6–7 μ. *Caro* albida, fracta sublutea, 1·5 cm. crassa.

SINGAPORE. On the ground, *Ridley*, 11, ser. 2.

A very distinct species, characterised by the pileus becoming more or less depressed and undulated with age, the white colour of every part, a tinge of yellow only appearing in the tubes and on the stem, and more especially by the sub-equal stem being everywhere covered with raised ribs, anastomosing to form an irregular network. Allied to the group of species of which *B. chrysenteron*, Fries, may be accepted as typical.

Boletus pachycephalus, *Massee*.

Pileus pulvinatus, velutinus, brunneus centro saturatiore, 5 cm. diam. *Tubuli* brevissimi, stipiti adnati vel decurrentes, ex albo sublutescentes; pori angulati aut sinuoso-elongati, mediocres, roseo-rufescentes. *Stipes* solidus, curtus, basi incrassatus, nigro-brunneus, glaber, 2–3 cm. longus, 1·5 cm. crassus. *Sporae* ellipsoideae, flavo-virides, 8–9 × 4 μ. *Caro* alba, immutabilis, crassissima, compacta.

SINGAPORE. On the ground, *Ridley*, 24, ser. 2.

Remarkable for the very dark colour of the stem and pileus, very short tubes, and exceedingly thick, compact, unchangeable flesh. Allied to *B. chrysenteron*, Fr.

Boletus funerarius, *Massee*.

Pileus carnosus, e subhemispherico expansus depressusve, subumbonatus, siccus, velutinus, atro-brunneus, interdum centro squamulosus, 8–10 cm. latus. *Tubuli* stipiti adnati, elongati, fuscescentes ; pori magni, elongato-hexagoni, brunnei. *Stipes* farctus, aequalis, longitudinaliter fibroso-striatus, brunneus, 5–6 cm. longus, 1–3 cm. crassus. *Sporae* fusiformae, leniter curvatae, olivaceo-griseae, 9–10 × 4–4·5 μ. *Caro* compacta, alba, 2 cm. crassa.

SINGAPORE. On the ground, *Ridley*, 50, ser. 2.

A sombre, uninviting species, characterised by brownish-black veivety pileus and brown tubes and pores. The general structure approaches that of *Boletus chrysenteron*, Fries.

Boletus Ridleyi, *Massee*.

Pileus pulvinatus, velutinus, hinc inde lacunosus vel quasi alveolatus, laete incarnatus, siccus, 8–9 cm. latus. *Tubuli* elongati, adnati, flavo-virentes : pori angulati vel elongato-hexagoni, tubuli concolores. *Stipes* farctus, peraltus, sursum attenuatus, alveolatus alveolis elongatis, pileo concolor, sursum flavicans, 12–15 cm. longus, ad basin 3 cm. crassus. *Sporae* fusoideae, olivaceo-tingentes, 12–13 × 5 μ. *Caro* albida, spongiosa vel cavernosa, fracta subrubescens.

SINGAPORE. On the ground, *Ridley*, 87, ser. 2.

A very beautiful and distinct species, characterised by the clear flesh-coloured, velvety pileus, and the very long, alveolate, red stem. Allied to *B. subtomentosus*, L., and *B. impolitus*, Fries.

Boletus unicolor, *Massee*.

Pileus pulvinatus, levis, glaber, ochraceus centro fuscidulo, margine primo involuto dein fisso, 9–10 cm. latus. *Tubuli* ochraceo-virentes, adnati vel subdecurrentes ; pori angulati ampli, ochraceo-rufescentes. *Stipes* solidus, elatus, deorsum attenuatus, fibroso-striatus, pileo concolor, 10–12 cm. longus, sursum 2·5 cm. crassus. *Sporae* pallide ochraceae, oblongo-ellipticae, 11–12 × 5 μ. *Caro* persistenter alba, crassa, compacta.

SINGAPORE. On the ground, *Ridley*, 99, ser. 2.

Readily distinguished by the ochraceous colour of every part, the elongated, fibrillosely striated stem, tapering downwards. Belongs to the section of the genus including *Boletus bovinus*, Fries.

Boletus longipes, *Massee*.

Pileus convexo-planus, in exoletis centro plus minusve depressus, viscosus, glaber, griseus centro saturatiori, 3–4 cm. latus. *Tubuli* elongati, flavo-virentes, liberi ; pori angulati, ampli, griseo-flavidi, marginibus flavi. *Stipes* solidus, elongatus, subaequalis vel basi subincrassatus, flexuosus, glaber, pileo concolor, basi albus, 7–8 cm. longus, 2–3 mm. crassus. *Sporae* flavo-brunneae, ellipsoideae, leniter curvatae, 12 × 5 μ. *Caro* alba.

SINGAPORE. On the ground, *Ridley*, 81, ser. 2.

Remarkable for the long, slender, flexuous stem. The pileus is plane, becoming depressed at the centre when old. This species is probably gregarious, as nine excellently preserved specimens accompanied the coloured drawing. Approaching *B. fuligineus*, Fries, in general structure.

Boletus parvulus, *Massee*.

Pileus hemisphaerico-explanatus, obtusissime umbonatus, margine integro undulato, minute squamulosus, pulchre flavo-fulvescens centro obscuriore, 5–6 cm. latus. *Tubuli* in stipite subdecurrentes, curti, cinerascentes ; pori minutissimi, rotundati, roseo-tincti. *Stipes* solidus, sursum incrassatus, glaber, pileo concolor, 4–5 cm. longus, supra 1–5 cm. crassus. *Sporae* cymbiformae, vix carneo-tinctae, 7–8 × 5 μ. *Caro* spongiosa, 1·5 cm. crassa, albida.

Singapore. On the ground, *Ridley*, 56 bis, ser. 2.

A very neat, clear-coloured fungus, characterised by the tawny-yellow pileus and stem, and the rose-tinted pores.

Allied in general structure to *Boletus rufo-aureus*, Massee ; differing in the smaller size, minutely squamulose pileus and rosy pores.

Boletus nanus, *Massee*.

Pileus pulvinatus, carnosus, interdum undulatus, siccus, primitus levis dein centro rimoso-areolatus, olivaceo-fuscus, 1–1·5 cm. latus. *Tubuli* subliberi, curti, flavescentes ; pori angulosi, pro ratione magni, flavo-virentes. *Stipes* solidus, plus vel minus flexuosus, æqualis, luteus apice roseus furfuraceusque, 4 cm. longus, 3–4 mm. crassus. *Sporae* fusoideae, flavido-albae, 6 × 3·5 μ. *Caro* compacta, albida, versus marginem tenuissima.

Singapore. On the ground, gregarious, *Ridley*, 39, ser. 2.

A very beautiful and well-marked species, reproducing in miniature all the characteristic features of *Boletus chrysenteron*, Fries.

Boletus flexipes, *Massee*.

Pileus tenuis, e convexo planus, interdum centro depressus, glaber, castaneus, zona lata umbrina in medio pilei ornatus, 4–5 cm. latus. *Tubuli* in stipite subdecurrentes, curti, flavescentes ; pori rotundati, minutissimi, aurei. *Stipes* solidus, flexuosus, sursum attenuatus, pallidus vel tinctura leviter rubescente-flavida praeditus, 6 cm. longus, 6–8 mm. latus. *Sporae* oblongo-fusoideae, interdum curvulae, 7–9 × 5 μ. *Caro* 3–4 mm. crassa, compacta.

Singapore. On the ground, *Ridley*, 97, ser. 2.

A very beautiful species, readily recognised by the plane, chestnut-coloured pileus, golden pores, and pallid, flexuous stem. Its affinity is with *Boletus vaccinus*, Fries.

Boletus flavipes, *Massee*.

Pileus primo hemisphaericus, dein modice explanatus, margine non vel vix curvulus, dein gradatim expansus, laevis, glaber, sordide castaneus, 3–4 cm. latus. *Tubuli* stipiti adnati, curti ; pori rotundati, minuti, albi. *Stipes* teres, subflexuosus, farctus, aetate cavus, flavus, 4 cm. longus, 5–6 mm. crassus. *Sporae* fusiformae, subhyalinae, 6–7 × 3·5 μ. *Caro* compacta, 1 cm. crassa, albida.

Singapore. On the ground, *Ridley*, 25, ser. 2.

A very neat little species, characterised by the white tubes and pores and the slightly flexuous, yellow stem. Allied to *Boletus tenuipes*, Cooke.

Strobilomyces paradoxus, *Massee*.

Pileus carnosulus, margine abrupte tenuis, incurvus, primo hemisphaericus, dein explanatus, umbrinus, dense irregulariterque verrucosus, aetate glabrescens, 6–7 cm. latus. *Tubuli* curtissimi, stipiti adnati; pori polygoni seu alveolati, brunnei. *Stipes* farctus, subaequalis, glaber, pileo concolor, 4–5 cm. longus, 5–6 mm. crassus. *Sporae* oblongo-ovatae, basi oblique apiculatae, longitudinaliter striatae, flavo-brunneae, 9–11 × 5 μ.

SINGAPORE. On the ground, gregarious, *Ridley*, 28, ser. 2.

A very remarkable species, possessing features characteristic of the genera *Boletus* and *Strobilomyces* respectively. It approaches the last-named genus in the characteristic dusky brown colour; warted pileus becoming glabrous when old; oblong form of spores, with an ornamented epispore. On the other hand, all previously known species of *Strobilomyces* have a very fleshy pileus, shaggy stem, and long tubes. The points in common with *Boletus* are smooth stem, short tubes, as in *B. flexipes*, Mass., and thin flesh, as in *B. bovinus*, L.

XXV.—MYROBALANS.

(*Terminalia Chebula*, Retz.)

The following article on this important tanning material of commerce, to which some additional information is added, appeared in the *Indian Forester*, 1907, p. 362 :—

"On the Western Ghauts this species does not usually exceed a height of 25 feet or a girth of 3½ feet. The bole as a rule is very short, branching often beginning lower than 2 feet from the ground. The crown is very spreading and the root system shallow. The species is essentially light-demanding. It flourishes on laterite at an altitude of 4,500 feet; here its chief associate is *Eugenia Jambolana*. The new foliage appears about the beginning of April, soon after which the flowers, all bisexual, are displayed in spikes; on an average there are about 40 flowers in each inflorescence, but the number of ovaries ultimately developing into fruit on a single peduncle does not usually exceed 10. The leaves are mostly sub-opposite, glabrous, shining and coriaceous, measuring 3-6 in. by 2–2 in.

"The fruit (the Myrabolam of Commerce), which is a drupe ovoid in shape and an inch long by half an inch broad in the middle, is also glabrous and appears about the end of May. It is at this time light green with tiny yellow spots; the upper part, perhaps on account of the influence of stronger light, frequently changes to a dark purple maroon.

"During the monsoon the fruit turns a greenish yellow. At this period the 'hirda' (this is the name by which the fruit is known to the Maharatta) is sold by auction whilst on the tree, and materially adds to the revenues of those Forest Divisions situated in the *T. Chebula* zone.

"The successful bidder begins collecting in October, and for his convenience depôts are erected at suitable centres, serving also the

double purpose of housing guards. Villagers collect the fruit in bags, baskets and blankets, conveying it to the nearest depôt, where individual collections are measured and payment made by the contractor at the rate of six pies per 'adshiree'; this is a cylindrical measure $4\frac{1}{2}$ inches in diameter and $10\frac{1}{2}$ inches in depth.

"Collecting operations continue up to the end of March, most of the hirda at this particular time being quite yellow. The fruit at the depôt is at once spread out on ground specially prepared; all grass, loose sand and dirt are cleared away, the area being well swept until its surface resembles that of a clean threshing floor. The hirda, having been spread evenly and in a single layer over the ground, is turned over every second or third day to ensure perfect drying in full sun-light, for it is mainly on this process that the ultimate commercial value of the myrabolam depends. On an earthy floor drying occupies, in fine weather, a period lasting twenty days, but on a rocky area this period is about halved, owing to the amount of heat received by rocks during the day and retained for some time after sunset. Moreover, when the dew falls the moisture is more quickly evaporated from a rocky than from an earthy surface.

"A few showers of rain destroy the valuable properties of hirda; to contend against any emergency, therefore, the contractor builds one or two temporary sheds, in which the hirda is quickly stored as soon as the sky becomes threateningly cloudy. The fruit when perfectly dry is a little larger than half its original size. During the drying process it becomes ridged, and then the outer layer of the pericarp is hard enough to resist the blade of a penknife. A small percentage of the hirda, however, does not become ridged, and in such cases it is found that almost the whole of the interior of the fruit has turned into a black powder which is much used for making ink; such fruits, known by the natives as 'bhonga' hirda, are considered worthless for dyeing and tanning purposes. The ridged, or valuable dry, hirda is next stored in bags and despatched to Europe, a comparatively small quantity being retained for sale in this country. Various decoctions prepared from the chebulic myrabolam are used as cathartics by natives.

"The natural reproduction of *Terminalia Chebula* is generally good. Once germination has taken place the young seedling soon establishes itself, and in spite of repeated fires sweeping through the area the plantlet quickly recovers, thus exhibiting great tenacity of life. Stools, the result of illicit exploitation, coppice vigorously. The leaves of the seedling and coppice shoot are tomentose, but this character soon wears away. For purposes of artificial restocking a reservation is made by the Forest Department to the extent of one maund (24 adshirees) per beat of the forests in which hirda is found. Germination is generally backward with regard to the ridged hirda; but that known as 'bhonga' readily germinates, because the hard, stout nut has been transformed into a black powder, and this destruction of the pericarp would appear to be due to a fungus. If this is a fact, then we have an instance of a fungus doing good, instead of the usual harm, by removing the endocarp which, in the ridged hirda, seems to be the chief obstacle

to successful germination. It is most probable also that a fire may do some good in the case of hirda, as it has been said to do in the case of teak.

"Injury is done to the inflorescence by a species of *Cynipidae*. This insect causes fairly large, irregularly shaped, red galls on the peduncle, and in doing so destroys several of the flowers. It therefore is responsible for a large reduction in the crop of the year. The nearer the gall is situated to the base of the peduncle the greater must be the amount of harm done since the gall or galls, to remain in a healthy condition, must undoubtedly assimilate a certain quantity of the nourishment during its passage up the main food channel of the inflorescence. Further, the terminally situated flowers (or fruit) must suffer most, and may, because of this deprivation of nutriment, die eventually, the degree of deprivation depending on the size and number of the galls. Species of *Rodentia*, such as the squirrel and rat, devour the fruit voraciously in plantations.

"The wood is considered useful by villagers for carts and agricultural implements, but this will always remain a secondary consideration in comparison with the fruit.

"In felling operations *T. Chebula* is, of course, reserved, and it would be advantageous to prescribe a sylvicultural rule to the effect that the crown should be given full freedom to spread in all directions. Being thus favoured, more light would result in an increase of foliage and the quantity of fruit would also correspondingly increase.

"A tree yielding annually such valuable produce is certainly good capital. The majority of timber-producing species reach the age of exploitability when about from 90 to 120 years old; there is no reason to doubt that *T. Chebula* does attain such an age, and indeed continue beyond it, regularly producing from about its fifteenth year a steady interest in the form of fruit."

To Messrs. Dalton & Young, Fenchurch Street, London, E.C., we are indebted for the following particulars of the commercial varieties of myrobalans distinguished in the English market together with the present value per cwt. C.I.F., United Kingdom ports.

	Picked.	Nos. 1.	2.	3.
	s. d.	*s. d.*	*s. d.*	*s. d.*
From Bombay.				
Bhimlies	7 3	6 6	4 10½	—
Jubbulpore ...	6 3	5 7½	4 10½	—
Rajapore	6 0	5 4½	4 9	—
Vingorlas	—	5 3	4 7½	—
From Calcutta.				
Central Indian ...	—	5 9	5 0	4 6
Calcutta	—	5 6	4 9	4 0
From Madras.				
Fair Coast ...	—	4 10	—	—

In recent years Jubbulpores have been shipped in a crushed form with the kernels extracted. This was formerly done by hand, now by a crushing machine.

The total exports of myrobalans from India for the year 1908 are as follows :—

		Cwts.		*Value.*
United Kingdom	...	1,013,878	...	£244,712
Germany ...	...	291,526	...	82,976
Belgium	...	225,484	...	63,992
Other Countries	...	252,304	...	67,113
		1,783,192	...	£458,793

XXVI.—DIAGNOSES AFRICANAE : XXIX.

1021. **Triplochiton nigericum**, *Sprague* [Sterculiaceae-Mansonieae], a speciebus adhuc descriptis foliis septemlobis lobis oblongis recedit.

Arbor alta ligno albido molli. *Folia* decidua, septemloba, 12–22 cm. longa, 15–26 cm. lata, lobis oblongis subabrupte acuminatis ; petioli 5–9 cm. longi ; stipulae mox deciduae, arcuatae, 1·5–2 cm. longae, acutae, apice pilosae. *Cymae* in axillis foliorum delapsorum ortae ; bracteolae 3, late ovatae, in articulatione pedicelli insertae. *Calycis tubus* 2–3 mm. longus ; lobi ovati, 6 mm. longi, 3·5–4 mm. lati. *Petala* obovata, 1 cm. longa, 9 mm. lata, inferne rubro-brunnea, superne alba, dense villosa, appendice squamiformi tomentoso 0·5 longo in ungue 1 mm. supra basin inserto primum erecto tandem reflexo. *Discus* nectariferus pentagonus, planus, fundum calycis vestiens, angulis antipetalis. *Gonophorum* 3 mm. longum, acute 5-angulatum angulis antisepalis dense pubescentibus. *Stamina* 44–46 ; filamenta 2–3 mm. longa, paria inferne connata ; antherae monothecae. *Staminodia* antisepala, late ovato-oblonga, convexa, 3 mm. longa, inferne pellucide areolata. *Carpella* antipetala ; ovarium anguste angulato-ovoideum, 2 mm. longum, extrorse dense papillosum ; stylus 1 mm. longus, pilosus. *Fructus* 1 cm. longus ala exclusa, superne dense villosus, ala 3–3·5 cm. longa.

Southern Nigeria. Oloke Meji, *Foster*, 370 ; Ibadan Forest Reserve, *Punch*, 125 ; Jebu Ode, *Punch*.

According to Mr. Punch it is the commonest tree in the Lagos forests, and is known by the native name "Arere." It sheds its old leaves just before, or at the time of flowering.

In the original description of *Triplochiton* the position of the staminodes and carpels was not stated ; the staminodes are antisepalous and the carpels antipetalous, just as in *Mansonia*. The disc and the appendage to the petal are present also in *T. Johnsonii*, but have not hitherto been described. The petal appendage, which is at first erect, finally becomes reflexed parallel to the claw, and is then inconspicuous.

In all the species of *Triplochiton* of which flowers are known the filaments are connate below in pairs, and the anthers appear to be monothecal. A flower-bud of *T. scleroxylon* selected for examination had both stamens and carpels, both apparently functional, and

the flowers in this species are probably polygamous. As the leaves resemble those of *T. Johnsonii*, it is possible that the relationship between these two species is closer than was at first thought.

1022. **Dicraea tenax**, *C. H. Wright in Dyer, Fl. Trop. Afr.* vi. sect. 1. part i. p. 125 (anglice) [Podostemonaceae-Eupodostemoneae]; *D. Wallichii*, Tul., affinis, foliis pluribus trilobis recedit.

Planta cornea, aenea. *Caulis* ramosissimus, leviter compressus, 1 mm. diam. *Folia* numerosa, inferiora laxe disposita, superiora imbricata, quadrata, triloba, vix 1 mm. longa. *Spathellae* tubulares, irregulariter dentatae, virides, 2 mm. longae; pedicelli in aestivatione inflexi; bracteae foliis similes. *Stamina* 2; filamenta dimidio inferiori connata; antherae 2-loculares. *Stigmata* linearia, deflexa. *Capsula* 2-valvata, 2 mm. longa, vix 1 mm. diam.; valvae aequales, 5-nervae, apice edentatae.

Rhodesia. Livingstone Island, Victoria Falls, growing in the very swirl of the rapids, *Kolbe*, 3149.

This much resembles the Brazilian *Podostemon Chamissonis*, Tul., in habit.

1023. **Dicraea Garrettii**, *C. H. Wright in Dyer, Fl. Trop. Afr.* vi. sect. 1. part i. p. 126 (anglice) [Podostemonaceae-Eupodostemoneae]; *D. tenaci*, C. H. Wright, affinis, bracteis longe laceratis differt.

Caulis ad 10 cm. longus, ramosus, compressus, corneus. *Folia* laxe disposita, circa 2 mm. longa, irregulariter lobata. *Flores* in fasiculos terminales dispositi; pedicelli ante anthesin inflexi, demum 12 mm. longi; bracteae 6 mm. longae, basi vaginantes, parte superiore laceratae; spathellae tubulares, uno latere fissae, 4 mm. longae. *Perianthii* segmenta parva, linearia. *Filamenta* 4 mm. longa, ovarium superantia, ultra medium connata. *Ovarium* ellipsoideum, costatum; stigmata subulata; gynostemium 1 mm. longum. *Capsula* 1·75 mm. longa, 1 mm. diam.; valvae aequales, 3-costatae.

Tropical Africa. Sierra Leone; Sherboro, *Garrett*.

1024. **Aristolochia rigida**, *Duch.*, **var. major**, *C. H. Wright in Dyer, Fl. Trop. Afr.* vi. sect. 1. part i. p. 139 (anglice) [Aristolochiaceae]; a typo notis sequentibus differt.

Folia 7·5 cm. longa, prope basin 6 mm. lata. *Bracteae* 3·8 cm. longae, 8 mm. latae, ovato-lanceolatae, longe acuminatae, mucronatae, marginibus incrassatis scabridis. *Perianthium* 3·8 cm. longum; limbus 2·5 cm. longus vel ultra.

Somaliland. Lasgori and Ahl Mountains, about 480 m., *Hildebrandt*, 873.

This variety has a very different aspect from the type, which may be due to growing in a moister locality. The difference in the shape of the bracts is very striking.

1025. **Aristolochia Kirkii**, *Baker in Dyer, Fl. Trop. Afr.* vi. sect. 1. part i. p. 139 (anglice) [Aristolochiaceae]; *A. Mannii*, Hook. f., affinis, perianthii limbo unilaterali distinguitur.

Caules tenues, scandentes, primum pubescentes, demum glabri. *Folia* triloba, subcoriacea, supra sparse verrucosa, subtus ad nervos pubescentia, 7·5 cm. longa; lobus terminalis oblongus, obtusus, circa 2 cm. latus, nervis 3 primariis parallelis; lobi laterales rotundati, 1·8 mm. diam., 3-nerves, sinu lato sejuncti; petioli

tenues, 1 cm. longi, pubescentes. *Cymae* axillares, pauciflorae; bracteae ovatae, 2 mm. longae, pubescentes. *Perianthium* basi subglobosum, 4 mm. diam.; tubus 10 mm. longus, ore 6 mm. diam., inferne cylindricus, superne infundibuliformis, uno latere emarginatus, altero in limbum lanceolatum 6 mm. latum plus quam 12 mm. longum productus. *Gynostemium* subsessile. *Stamina* 12; antherarum loculi lineares, quam gynostemium duplo breviores. *Styli* rami subulati.

Portuguese East Africa. Lower Zambesi; Shiramba, *Kirk*. Lower Shire River; Moramballa, 917 m., *Kirk*.

The apex of the perianth-limb has been broken off all the flowers I have seen.

1026. **Piper brachyrhachis**, *C. H. Wright in Dyer, Fl. Trop. Afr.* vi. sect. 1. part i. p. 147 (anglice) [Piperaceae-Pipereae]; *P. pseudosilvatico*, C. DC., affine, ramis pubescentibus differt.

Frutex 2 m. altus. *Rami* pubescentes. *Folia* ovata, acuminata, basi rotundata, 5–7-nervia, subtus dense villosa, supra glabra, 14 cm. longa, 9 cm. lata; nervi laterales 2–4, e laminae basi ipsa orti, reliqui suprabasilares; petioli 2·5 cm. longi, supra canaliculati, villosi. *Pedunculus* tenuis, 1·8 cm. longus, villosus; spica 10 mm. longa; bracteae peltatae, glabrae, albae; flores polygami. *Stamina* 3; filamenta complanata; antherarum loculi segregati. *Ovarium* ovoideum, compressum; stigmata 2.

British Central Africa. Nyasaland, between Mpata and the commencement of the Tanganyika Plateau, 600–900 m., *Whyte*; Nyika Plateau, 1200–2100 m., *Whyte*, 199.

1027. **Peperomia crassifolia**, *Baker in Dyer, Fl. Trop. Afr.* vi. sect. 1. part i. p. 154 (anglice) [Piperaceae-Pipereae]; *P. Mannii*, Hook. f., affinis, foliis crassis opacis differt.

Caulis decumbens, 2 mm. crassus, glaber, circa 3 dm. longus. *Folia* alterna, orbicularia, obtusa, basi rotundata, 1·4 cm. longa, crassa, opaca, supra glabra, subtus sparse pubescentia; costa per totam laminam conspicua; nervi laterales inconspicui, ascendentes; petioli 4 mm. longi. *Spicae* terminales et laterales, tenues, ad 7 cm. longae; rhachis glaber; pedunculi glabri, 1·5 cm. longi. *Ovarium* sessile, globosum; stigma terminale.

Uganda. Wimi Valley, Ruwenzori, 2079 m., *Scott-Elliot*, 7928.

1028. **Chloropatane Batesii**, *C. H. Wright in Dyer, Fl. Trop. Afr.* vi. sect. 1. part i. p. 169 (anglice) [Monimiaceae]; a *C. africana*, Engl., foliis basi cuneatis nervisque lateralibus paucioribus distinguitur.

Frutex 1–2 m. altus. *Rami* tenues, teretes, cinerei, glabri. *Folia* elliptica, cuspidata, basi cuneata, 13 cm. longa, 5 cm. lata, tenuiter membranacea, dilute viridia, subtus minute verrucosa, ad nervos primarios puberula, caeterum glabra; nervi laterales utrinque 4–6, tenues, intra margines arcuatim connexi; petioli 1 cm. longi, puberuli. *Racemi* axillares prope ramorum apices; pedunculi tenues, 2 cm. longi; pedicelli filiformes, 1·8 cm. longi. *Flores* masculi 5 mm. diam. *Perianthium* breviter 4-lobatum, viride, glabrum, ante anthesin globosum. *Antherae* obovoideae. *Flores* feminei ignoti.

Tropical Africa. Cameroons; Efulen, *Bates*, 409.

1029. **Tylostemon (Ennearrhena) sessilifolius**, *Stapf in Dyer, Fl. Trop. Afr.* vi. sect. 1. part i. p. 175 (anglice) [Lauraceae-Perseeae]; ab omnibus speciebus notis foliis sessilibus basi cordatis distinctus.

Frutex (vel arbor ?) ramulis robustis exsiccando cinerascentibus glabris. *Folia* sessilia, oblanceolato-oblonga, in acumen angustum ad 2·5 cm. longum producta, basi cordata auriculis rotundatis, ad fere 40 cm. longa et ultra 10 cm. lata, papyracea, glabra, exsiccando fusca, nervis lateralibus utrinque circiter 12 ascendentibus inferioribus multo magis obliquis quam superioribus, venarum reticulatione utrinque prominula. *Panicula* ultra 7·5 cm. longa, 5 cm. lata, subgracilis, superne tenuiter pubescens; pedunculus brevis; rami inferiores distantes, ad 5 cm. longi, supra medium multiflori; ramuli ultimi ordinis et pedicelli brevissimi, tenues. *Perianthium* subgloboso-turbinatum, 1·5 mm. longum, extus minutissime pubescens, segmentis rotundatis receptaculo aequilongis. *Stamina* introrsa, filamentis antheras aequantibus ad earum bases et secus lineam mediam minute pilosis; staminodia triangularia. *Afrodaphne sessilifolia*, Stapf, in *Journ. Linn. Soc.*, vol. xxxvii., p. 111, et *Beilschmiedia sessilifolia*, Engl. ex Stapf, l.c. [nomina tantum].

West Africa. Cameroons, Bipinde, *Zenker*, 2256 !

When I described the genus *Afrodaphne* in the *Journal of the Linnean Society* in 1905 (vol. xxxvii., p. 110), I was well aware of Engler's genus *Tylostemon*, described in 1899; but there were then no specimens of the species referred to it at Kew, and the fact that the description of *Tylostemon* followed the descriptions of several species of *Beilschmiedia* in Engler's paper, as well as the statement that the staminal glands of *Tylostemon* were adnate to the filaments all along led me to the conclusion that *Tylostemon* and the African Beilschmiedias belonged to two distinct genera. As the African Beilschmiedias appeared to me to differ generically from the original Beilschmiedias of the Indo-Malayan region, I made them into a distinct genus *Afrodaphne*. Since then I have had an opportunity of examining the original species of *Tylostemon*, thanks to the courtesy of Professor Engler, and found that his African Beilschmiedias, and therefore my species of *Afrodaphne*, are congeneric with *Tylostemon*. The staminal glands of the original Tylostemons are very like those of Engler's African Beilschmiedias, and they are attached in the same way, as may also be seen from the rather diagrammatic figures on plate ix. of Engler's paper.

The affinity of *Tylostemon* lies rather with the American genus *Hufelandia* than with *Beilschmiedia* proper, and the authors of the *Genera Plantarum* (vol. iii., p. 152) actually referred Meisner's *Oreodaphne minutiflora*, *O. Mannii*, and *O. gaboonensis* (that is *Tylostemon minutiflorus*, *T. Mannii*, and *T. gaboonensis*) to the section *Hufelandia* of their *Beilschmiedia*. Both *Hufelandia* and *Tylostemon* have always a distinct receptacle, against the very deeply divided perianth of *Beilschmiedia*; but *Hufelandia* differs from *Tylostemon* in the leaves being more or less glaucous-pruinose below, and in having the connective produced at the apex, and the styles very short. Both form fairly homogeneous groups.

1030. **Tylostemon grandifolius**, *Stapf in Dyer, Fl. Trop. Afr.* vi. sect. 1. part i. p. 177 (anglice) [Lauraceae-Perseae]; a speciebus sectionis *Ennearrhenae* perianthio pro genere masusculo (2 vel ultra 3 mm. longo) donatis indumento inflorescentiae copioso et receptaculo angustius campanulato distinctus.

Ramuli robusti, exsiccando fusci. *Folia* oblanceolato-oblonga, brevissime acute acuminata, sensim basi attenuata, 15–25 cm. longa, 7–9 cm. lata, coriacea, glabra, nervis lateralibus utrinque 6–7 perobliquis, venis laxe anastomosantibus utrinque prominulis; petiolus robustus. *Paniculae* subterminales, floribundae, ad 12 cm. longae, et 8 cm. latae, undique minute fulvo-tomentellae; pedunculus brevis, compressus; rami inferiores ad 5 cm. longi, ad 2–2·5 cm. indivisi; ramuli ultimi ordinis pedicellique raro ad 2 mm. longi. *Perianthium* campanulatum, 3 mm. longum vel paulo longius, minutissime puberulum; receptaculum segmentis ovatis vel rotundatis aequilongum vel paulo longius. *Stamina* introrsa filamentis papillosis antheras aequantibus basi subattenuatis; stamina extrorsa filamentis sublinearibus dense tomentellis utrinque glanduligeris; staminodia subcordato-triangularia. *Ovarium* sensim in stylum aequilongum attenuatum. *Afrodaphne grandifolia*, Stapf in *Journ. Linn. Soc.* xxxvii. 111 (nomen); *Cryptocarya? grandifolia*, Engl. ex Stapf, l.c.

West Africa. Cameroons, Bipinde, *Zenker*, 2250, 2250*a*.

XXVII.—THE VEGETATION OF THE PASTASA AND BOMBONASA RIVERS.

The following notes by Richard Spruce on the vegetation of these tributaries of the Marañon branch of the Amazon on the lower eastern slopes of the Ecuadorean Andes have been sent to the Director by Dr. Alfred Russel Wallace. The account of Spruce's hazardous journey in this remote and almost unknown region has already been published in Chapter xvii. of the second volume of the "Notes of a Botanist on the Amazon and Andes" edited by Dr. Wallace. It had been the intention of the Editor to make a short chapter on the vegetation notes in the book, but since they are somewhat fragmentary and essentially botanical it was decided to omit them.

The journey up the rivers Pastasa and Bombonasa—a distance of nearly 500 miles—which occupied about three months, was made entirely in canoes. After a journey of about 19 days from the junction of the Pastasa with the Marañon, Spruce reached Andoas at the mouth of the Bombonasa whence he travelled to Canelos. In the course of the journey Spruce mentions the occurrence of tributary streams both of black and of clear water similar to those he had noticed on the Rio Negro. It was when at Puca-yacu that a terrific thunderstorm nearly brought the expedition to an untimely end; the river, only 40 yards broad, and less than 3 feet deep at the particular spot where the canoes were moored, rose 18 feet during the night, and had it not been for the exertions of the Indians in hanging on to the strong lianas of a *Bignonia*, securely entwined in the branches

of the trees overhead, they would assuredly have been swept away to instant destruction by the roaring flood. Moreover, they were in constant danger of being dashed to pieces by the floating trees which were borne along by the torrent. It was not until after 10 o'clock on the following day that they were able to relax their efforts and feel themselves secure. Dr. Wallace has furnished a short prefatory paragraph to the extracts from Spruce's journal which follow :—

Notes on the Vegetation made during the Voyage up the Pastasa and Bombonasa.

[Interspersed throughout the Journal of this tedious canoe-voyage are very numerous observations on the general character of the vegetation as well as records of species identified as being known from other parts of the Amazon valley, or as being, probably or certainly, new species. It must be remembered that during this long journey it was quite impossible for Spruce to make any collections of flowering plants ; but he was so close and accurate an observer, and had by this time acquired such an extensive knowledge of the Amazonian flora, that I think it my duty to give some portion of these notes for the use of such botanists as may not be able to consult the original notes and Journals which have been presented to the Kew Herbarium.

Of the first portion of these notes, dealing with the banks of the Pastasa river, I shall only give a very small portion to illustrate their general nature, as the river was monotonous, and the notes of comparatively little interest. But those of the Bombonasa river are much more detailed and of a more varied character, both from the greater diversity of the river banks and the decided sub-Andean character the vegetation began to present. These will be quoted at considerable length, and will, I think, be worth the attention not only of specialists in the botany of tropical America, but of all who take a general interest in the varied phenomena presented by the vegetable kingdom in a region where it is developed in exceptional luxuriance and grandeur.]

Vegetation of the Pastasa (from Journal).—At two days up the river the vegetation is still Amazonian—much rice in places—plenty of Ingas—much *Omphalea diandra* (*Euphorbiaceae*) and Abilla—abundance of a Dioclea (*Leguminosae*) with bramble-like leaves. . . . Palms are fairly abundant—Mauritia, two Attaleas, one apparently the *A. excelsa*. . . . .

April 16th. Same palms. . . . *Iriartea ventricosa*, scarce. . . . Assai abundant. . . . the Couroupita (*Lecythidaceae*) as at Tarapoto. . . . Pourouma (*Artocarpaceae*), Securidaca (*Polygalaceae*), a climbing Amaryllidea, &c.

A nutmeg (*Myristica mocoa*) is common, and another smaller species scarce. Twining Bignoniae and Malpighiaceae are common —one of the former with purple flowers seems new. A Gesnera on trees by the shore has the aspect of a Pilea ; it has yellow tubular flowers, while another with flowers and large red bracts is common. A Loganiaceous twiner (*Uncaria guianensis*) is rather frequent.

Castanella riparia and a yellow-flowered Bauhinia (*Schnella*) were also seen ; but the vegetation on the whole is miserably monotonous and Amazonian.

April 17th. On the ground in some places there are beds of a delicate Gesnera with white flowers, in habit like a larger-leaved *Chrysosplenium*. Sometimes on the edge of banks only a few inches above the water there is a beautiful fringe of *Gymnogramme calomelanos*.

April 22nd. A Davilla (*Dilleniaceae*) on the margins is just opening its sulphur-yellow, odoriferous flowers. Of trees with tall clear trunks, often white with rudimentary lichens, is a fig with lanceolate leaves ; an Acacioid tree with largish bipinnate leaves and numerous fine leaflets—habit of a Dimorphandra or a Pentaclethra.

Myrtles are very rare, but a small-leaved Myrcia does occur. The forest in some places is almost entirely composed of the Lecythidaceous tree allied to Gustavia (*Grias* sp.) mixed with Chapaja palms ; also a tall palm with small grey fruits like those of an Astrocaryum, but it has no prickles ; some Geonomas, Bactrides, and small Cyclantheae forming undergrowth. Here it was pleasant getting about.

Triplaris guianensis (*Polygonaceae*), the Tangarána of the Peruvians, is everywhere too frequent, and the ants which infest it wound us daily.

April 22nd. *Ochroma* sp. (*Malvaceae*) with deeply cordate leaves is frequent on inundated shores, with *Cecropia peltata*, and is one of the trees most frequently encountered fallen in the water (as the river goes on drying) from banks giving way.

A curious Rubiaceous twiner with large leaves like those of a Nonatelia, large interpetiolar stipules, and largish yellowish flowers like those of a Cinchona.

There were two species of Ruyschia (*Marcgraviaceae*) ; one very frequent has long branchlets with closely-set, almost linear leaves, and were it not for terminal umbels of red berries might almost be taken for a fern (*Pleopeltis*) as it hangs from trees.

Very frequent in woods is Paullinia, with dense clusters of flowers on the naked sulcate stem, surely same as from Coary—*P. rhizantha*.

On the margins of *tierra firme* an Urticaceous shrub (*Pilea* ?) with narrow leaves very like a Tarapoto species. Two composite herbs—one having much the aspect of Golden-rod, has long leaves, some trifid, some entire, very acute at base, and copious yellow flowers ; the other with similar flowers has broader cordate leaves. They occur on the inundated margin here and there, and exist also on the Bombonasa river.

Notes at Andoas.—Rainy weather, sore feet, the cares of engaging oarsmen and of procuring food for the voyage, left me small leisure for botany.

The last day of my stay I had a walk into the forest, which was cut short by the coming on of a heavy thunderstorm, and I returned *trempé comme un canard*. The track was very muddy as I went, but as I returned it was a little river with occasional lakelets. I noted another arborescent Alsophila, with subpilose fronds.

Other ferns were few, and common species. The mass of vegetation was similar to that in the moist forests of Yurimaguas, and the same Rubiacea with ternate leaves was frequent. There was also the large purple-flowered Nonatelia of Saõ Paulo and Tarapoto. There happened to be no palms save a small Bactris, a Geonoma, and an Astrocaryum.

The most remarkable plant noted was a Byttneriacea—a small tree with a slender unbranched trunk, 18 feet high, bearing fascicles of large red flowers near the base of the trunk and a few large, alternate, stipulate, digitate leaves at the apex. [Probably a *Herrania*]. I saw but one plant, though perhaps the rain hindered me from seeing more. Some curious terrestrial Gesnerae, several small-flowered Melastomaceae, nearly all of species unobserved before —chiefly Miconiae and Clidemiae.

Vegetation of Bombonasa.—Near the mouth precisely the same as in the Pastasa. The Mulatto-tree (*Enkylista spruceana*, Benth.), *Eriodendron Samauma?* Homaliacea, *Erythrina Amasisa*, Pithecolobium, as frequent as on the Pastasa. A Loganiaceous twiner is especially abundant. The small-leaved Ingas are not so abundant. They are known here, as on the Huallaga, by the name of Chimbillas, and were a great hindrance to our progress on the Pastasa, especially in the Encañadas (side-channels), as they always grow hanging far over, and into, the water, and we must necessarily go round them, instead of close by the margin, so that we had to oppose a stronger current. Their roots spread wide and intricate, and when the earth gives way beneath them (for they generally grow on the extreme edge of terra firma) they fall over, but still hang on, while the Cecropias and most other trees fall prostrate, and are at length carried away by the stream.

Old trunks of the Chimbilla (*Inga* sp.) become hollow in the centre, and have often large quantities of wax and honey deposited in them, by a small blackish bee which does not sting. In the Setikas (as Cecropias are called) two (and most likely more) species of small bee deposit wax and very little honey ; one of these makes black wax, used chiefly for the fabrication of small candles—this abounds most on the Bombonasa ; the other makes white wax, but the whitest wax of all is obtained from the Chimbilla.

In order to obtain the wax the trees are cut down, and those portions of the trunk and branches ascertained to contain wax are carried away in a canoe to a convenient beach, where a fire is made. The wax being extracted is melted down in pans, and then poured off into calabashes, where the extraneous matter settles to the bottom, and the wax remains on the top. With two boilings the wax turns out very white and clear. This explains why the wax of Pastasa is in almost hemispherical masses ; on the Marañon, where large shallow vessels are used as moulds, it turns out in cakes.

I saw the Governor of Andoas pay the Indians a cutlass for every 6 lbs. of this wax they should get out. These cutlasses cost six reals each in Tarapoto, which makes the prime cost of wax a real a lb., or £58 6*s.* 8*d.* per ton ; but then there is the labour and

time of bringing cutlasses from Tarapoto or Nauta, and the months to wait before the Indians bring the wax, which they rarely ever do in full weight.

The narrow-leaved Pithecolobium much resembles Chimbillas in aspect and in clinging on by its roots although the trunk may have fallen over almost horizontally. The small pods resemble those of the Inga, but the seeds are not involved in sweet cottony pulp like those of the latter. The Indians in passing a tree of Chimbilla laden with pods as they are now, generally contrive to snatch a handful, and suck them when they rest on their oars a few moments. Like all fresh fruits they are unwholesome in an aguish river.

On the Bombonasa, as the current is not very strong nor the volume of water great, even Cecropias often do not fall entirely on slightly ascending shores from which the earth slides away as the water recedes. When thus half fallen over, they immediately begin to put forth buttresses from the lower part of them, as if by a species of instinct ; these buttresses are of very rapid growth, and soon get to be little inferior to the stem in thickness, so that a tree thus supported is with difficulty uprooted either by winds or water. I have noted the same peculiarity in nearly all the terrestrial Artocarpaceae and Moraceae I have seen in Amazonian forests.

Iriartea exorrhiza and *I. ventricosa* are very frequent near the margin and often growing together. *Mauritia vinifera* in some places is very lofty, the head rising entirely above the surrounding forest. There are tall, slender specimens of *Iriartea exorrhiza*, but rarely so high as tall forest trees.

The forest where we remained the 10th of May contained many tall trees, chiefly figs and mulatto tree, the white flowers of a large Tiliacea, 3–sepalous, 6–petalous small, strewed the ground.

A good many palms mixed—*Iriartea exorrhiza* and *I. ventricosa*, *Wettinia Maynensis*—an Astrocaryum, near *A. vulgare*—a Bactris, *(Phytelephas) Yarina*, very abundant and sometimes, along with the *Iriartea ventricosa*, covering large flats, almost without mixture—stems sometimes 10 feet high deeply scarred but petiole-bases not persistent. *Discanthus odoratus* and other small Cyclanthaceae. Shrubs were few, and none in flower save an Acanthacea.

Patches of a flabellate Selaginella, an Acanthacea with sulphur flowers, scented like the primrose, a Commelynacea (*Dithyrocarpus*) near a Yurimaguas species, but larger.

In moist places, on leaves of ferns and other plants, a good store of the curious *Hookeria Patrisiae* in fruit, which is rare. Another pretty Hookeria was frequent on branches and in good fruit. I have seen it all along the Bombonasa. My Distianthus occurred very sparingly, as it always does. The ubiquitous vesiculose Hypnum was abundant. Save these there was nothing noticeable.

On the morning of the 12th, though the riparial vegetation was unchanged in general constituents, some new things were observed, a Humiriacea with white flowers allied to a Casiquiare species. Some shrubby small-flowered Rubiaceae in the forest, resembling Psychotriae, but not referrable to that genus. A curious fern exactly resembling a Lindsaea in aspect, and form of pinnae, but with the fructification of a Diplazium, fronds 1½–4 feet.

Wettinia Maynensis (*Palmae*) is now very frequent and grows occasionally close by the margin, along with the Iriarteas, from which it is distinguished at sight by the pinnae being equidistant and all spreading out from the rachis horizontally, but pendulous (from their weight) towards the apex, so that the entire frond has a widely channeled form. In the Iriarteas the laciniae of the pinnae are in fascicles, the uppermost of each fascicle standing out above the rachis, the lowest pendulous, the rest at intermediate angles, ♀ spadix very constantly 5-branched.

May 13. This day saw an Orchid in a tree for the first time since entering the Pastasa. It was an Epidendrum with corymbs of vermilion flowers, very like that from the falls of Aripecuru.

Chimbillas disappeared just within the mouth of the Bombonasa, but the Pithecolobium is more frequent than on the Pastasa. Two broad-leaved Ingas seen on the Marañon and Pastasa are still not unfrequent. Bamboos, Gynerium, and Cecropias still grow in suitable places, as do also the Mulatto-tree and Ama-Sisa (*Erythrina amasisa*).

The Chapaja and Biroti-wasi palms have given place to *Wettinia Maynenis*, *Iriartea ventricosa* and *Oenocarpus Bataua*. The Rio Negro Euterpe is not unfrequent.

In pursuing the Pinche a large animal fell from a projecting branch a little ahead of us with a loud crash and then darted off like an arrow. It was a tiger [jaguar], doubtless awaiting till some prey should pass beneath. I did not even see it, but the Indian who was a few steps in advance did, and the marks of its broad feet were plain enough on the ground. We followed its track a short distance, but it had made clear off.

Above Capirona-tipishco in places where steep cliffs rise from the water's edge the vegetation has great similarity to that of the Pongo of the Huallaga. There is the same peculiarity of fine-leaved species of several families, and some of the species seem identical. Along the high-water line, especially where there is any approach to a ledge, there is a dense growth of *Calliandra Magdalenae* (*Leguminosae*), the stems about 15 feet high and much branched, but generally stretching horizontally from the face of the rock. It grows also on the stony points of islands, where it is much inclined by the force of floods, and in this respect quite resembles the Calliandra of the Huallaga; but the branches are much more flexible, and not long and wand-like, as in the latter.

Below the Calliandra on an inundated face of rock is a broad bank of a small, almost stemless, Carludovica (*Cyclanthaceae*), the pendulous shining-green fronds bipartite, the segments so narrow, and at so small an angle to each other, that until closely looked at one would take the plant for a grass. It is very like the Yacu-Sisa of Tarapoto. Underneath the Carludovica grow ferns and mosses down to the water's edge, with here and there a scattered shrub. Of these shrubs the chief are a small Myrsinea and a very narrow-leaved Myrcia (*Myrtaceae*), both apparently identical with species at the Pongo of the Huallaga. There is also a narrow-leaved Rubiacea, resembling a Huallaga species, but different. I

do not, however, yet remark any representatives of the fine-leaved Lauracea and Melastomacea, so conspicuous on the Huallaga.

There are not wanting abundance of small-flowered, perennial Acanthaceae, of two or three species, and the moss, which everywhere hangs in long tufts from inundated branches, is (as on the Huallaga) *Neckera disticha*.

Carludovica palmata is not unfrequent on cliffs, but more frequent is a species resembling it in the flabellate, vandyke-edged fronds, which, are, however, smaller and bi- (not 4-) partite.

Two small suffruticose Lythraceae are frequent, one with white, the other with purple flowers. [Both are *Cuphea Bombonasae*.] On muddy margins is a third (twining) species of the same genus, as well as some Gesnereae. The most abundant ferns are a small form of Nephrodium and a Meniscium, both found at Tarapoto.

The mosses include a Bryum in large lax dingy patches.

Vegetation of the forests of Bombonasa, near Puca-yacu.—Numerous ridges rise to 200 feet or 240 feet above the rivers, and the valleys are deep, with often steep sides, clayey or gravelly, but with no beds of hard rock. There is some similarity to the ground about and above the mouth of the Rio Negro on the left bank, though the hills are there of less elevation.

Among trees there must be many new species, but none are now in flower. A Lecythidea, with leaves like a Lecythis, has round fruits (like apples) growing on the naked trunk, as in Couroupita. One tree is almost certainly a Henriquezia; the leaves grow in fours, and are much longer than those of *H. verticillata*. A tall Eriodendron, with the habit of *E. Samauma*, has no buttresses at the base of the trunk.

Of brushwood nearly everything seems of known genera, but many of the species are new. Solanums are in endless variety, as through the Pastasa, but individuals of each species are few flowered and grow widely apart, as is usual with forest species of this genus, with a few exceptions.

The Palms are *Iriartea exorrhiza* and *I. ventricosa*, the Biroti-wasi, and several small Geonomas and Bactrides.

The most striking feature of the vegetation of the gravelly slopes, as compared with those of the rivers Negro, Uaupes, and Huallaga, is the abundance of small gay-flowered Gesnereae, Acanthaceae, and Lobeliaceae; but there is some similarity to the valleys of Tavalosos and Mount Campana, near Tarapoto, and an Acanthacea, with numerous lilac flowers, is evidently of the same genus as a Campana plant, though a distinct species.

There are two or three Begoniaceae, one climbing species, remarkable in having all parts of the inflorescence of a bright vermilion.

The district cannot be called mossy, though trunks and branches of trees are in some places enveloped with *Plagiochila hypnoides* and two other common species, often accompanied by a Pilotrichum or Meteorium; but the richest genus is Hookeria, of which there are at least ten distinct species, growing chiefly in shady gullies on the branches of shrubs and on stones in the rivulets. *Bryopteris filicata* is very frequent, and *B. diffusa* hangs here and there.

The twining Selaginella is very frequent, not only near the villages, but far away in the forest, ascending trees to 20 feet, and sometimes forming an impenetrate thicket.

A handsome Polypod, sometimes 8 feet high, is frequent. About the village there are beds of a Davallia, 3–7 feet high, remarkable for the triangular outline of the fronds; and a Pteris, at first glance resembling *Pteris caudata*, but prickly. On branchlets of trees by rivulets is a minute Asplenium, allied to *A. Ruta-muraria*, not observed before.

From Puca-yacu to Canelos many Pastasa trees still occur, e.g. Ama-Sisa, Homaliacea, and the palms *Wettinia maynensis* and Biroti-wasi.

Hardly any tree is in flower, scarcely even an Inga, so that I cannot say what new trees begin to appear by the margin. There is one tree of 40–50 feet with pinnate leaves and very large leaflets, hoary beneath,which looks very like a Swartzia.

The cliffs are sometimes very mossy, and in a hasty look at one I detected a new Tortula, allied to *T. fallax*, but with more setaceous leaves. On inundated branches, along with *Neckera disticha*, grows a curious Neckeroid branched Fissidens, six or more inches long. The smooth-leaved *Lamas Condaminea* grows here and there on cliffs.

Orchids begin to be less unfrequent. A large-flowered Sobralia, allied to that of Campana, grows on wet cliffs, and on an inundated stump I saw the Tarapoto Cypripedium.

XXVIII.—WITCHES' BROOM OF CACAO.

(*Colletotrichum luxificum*, Van Hall & Drost.)

During the past twelve years a serious disease affecting the Cacao tree (*Theobroma Cacao*, Gaertn.), has been prevalent in Surinam. In 1906 the same disease was observed in Cacao plantations in Demerara by Mr. A. W. Bartlett, Superintendent of the Botanic Garden, Georgetown. The disease is indicated by the presence of hypertrophied shoots, which assume the well-known characters of a witches' broom. Such branches present a swollen appearance and often have strongly marked longitudinal furrows at the basal end. The leaves remain small and are soft and pliable. Lateral branches are produced in abundance, although the hypertrophied branch remains short. The general direction of growth of the branches is vertical, and the whole structure is ephemeral, soon dying.

In 1900 Professor Ritzema Bos investigated the disease, which he concluded to be caused by a fungus which he named *Exoascus Theobromae*. A specimen sent to Kew by Mr. J. H. Hart was examined, but only sterile mycelium penetrating all the tissues could be found, and this certainly did not belong to an *Exoascus*.

Quite recently Dr. C. J. J. Van Hall, Inspector of Agriculture in Dutch Guiana, and Mr. A. W. Drost, have paid much attention to the subject, and have proved that the disease is due to a parasitic fungus they have named *Colletotrichum luxificum*. No

species of *Exoascus* was observed. The inflorescence is also attacked, resulting in the production of a dense agglomeration of flowers, due to many of the pedicels giving off branches. Some of these branches assume a vegetative character, and form small witches' brooms. The flowers in such clusters are often hypertrophied and abortive.

It has been observed that in those plantations where witches' brooms were present much of the fruit was damaged. This injury, however, was generally considered by the planter to be identical with the "black pod" disease of cacao pods in the West Indies, caused by *Phytophthora omnivora*. A careful investigation of the subject by Hall and Drost showed that this was not the case, but that in reality the pod disease was caused by the same fungus that led to the production of the witches' brooms. The induration of the fruit presents the following characteristics: the hardening of the tissues of the infected area, which often forms a swelling in young or half-grown pods; the swollen or gouty appearance of the fruit stalks, and the blackening of the diseased patch. Such diseased pods rarely mature, but fall before they are half grown.

When witches' brooms are present in quantity the trees are often killed outright, and in those cases where the disease is less severe the yield of fruit is much less than under normal conditions. In addition to the formation of the witches' brooms the fruits themselves can be infected directly, and a large quantity is destroyed in this manner.

It has been ascertained that the disease spreads very slowly; a single badly attacked tree may be present for a long time in a plantation before the neighbouring trees show signs of the disease, and then its progress is at a slow rate. Nevertheless, the fact must be kept in view, that unless checked the disease does spread, and has been the cause of serious losses to planters on the mainland, to which it is, up to the present, confined.

So far as has been observed all varieties of Cacao trees are equally susceptible to the disease. Drainage appears to exercise no appreciable influence.

Owing to climatic conditions and the fact that the plants produce new shoots throughout the year, spraying with Bordeaux mixture is impracticable. As the disease spreads at a slow rate, the only certain remedy is the removal of all witches' brooms and diseased fruit. Wounds should at once be covered with tar. Diseased fallen fruit should be collected and burned.

Hall and Drost; Recueil des Trav. Bot. Néerl., Soc. Bot. Néerl., 4, p. 243, 17 pl. (1908).

Ritzema Bos; Tijdschr. over Plantenziekten, 6, p. 65 (1900).

XXIX.—MISCELLANEOUS NOTES.

Mr. A. W. Benton, a member of the gardening staff of the Royal Botanic Gardens, has been appointed, at the request of the Secretary of State for the Colonies, on the recommendation of Kew, Gardener for Government House, in the Falkland Islands.

Mr. J. Hutchinson, whose appointment as Assistant for India was recorded in *Kew. Bull.*, 1908, p. 421, has been transferred to the post of Assistant for Tropical Africa on the staff of the Royal Botanic Gardens.

Mr. W. G. Craib, M.A., formerly officiating Curator of the Herbarium attached to the Royal Botanic Gardens, Calcutta, has been appointed Assistant for India on the staff of the Royal Botanic Gardens by the Secretary of State for India in Council.

João Barbosa Rodrigues.—A Reuter telegram announced recently the death of Professor João Barbosa Rodrigues, the well-known Brazilian botanist and Director of the Botanic Garden at Lagoa Rodrigo de Freitas, near Rio de Janeiro.

Barbosa Rodrigues, the son of a merchant, was born in the State of Minas Geraes on June 22, 1842. He intended to qualify for the medical career, but, after the death of his father, adverse circumstances obliged him to abandon his studies and accept a post as secretary, and later on as drawing master at the Imperial Pedro II. College. Here he was introduced into the study of botany by Professor F. Freire Allemão. Botanical excursions in the neighbourhood of Rio de Janeiro and in his native state fitted him for the long series of expeditions which he undertook between 1869 and 1897, mainly in the Amazon basin, but later on also in the Southern States and in Uruguay and Paraguay. In 1883 he founded a botanical and ethnographical museum at Manáos, on the Amazon, which he superintended himself until 1889, when he was appointed Director of the Botanic Garden near Rio de Janeiro, a post which he held until his death. On his travels he does not seem to have availed himself much of the splendid opportunities for collecting. He rather studied plants from life, and, being a fair draughtsman, filled his portfolios with sketches and analyses, mainly of palms and orchids, his favourite families. His first descriptions and illustrations of members of these two families date back as far as 1875 and 1877 respectively. They were the first contributions to the great task he had set himself from the beginning of his botanical career, and to which he adhered with rare perseverance—namely, the elaboration of monographs of the *Orchidaceae* and *Palmae* of Brazil. He was not allowed to carry the monograph of the *Orchidaceae* to a conclusion. It was planned on a sumptuous scale, which, in the end, he found beyond his means. It was intended as an Iconographia, with coloured illustrations in natural size and analyses, of all the species found in Brazil. Up to 1891 he published preliminary diagnoses of not less than 573 new species, 25 new genera, and 1 new tribe, whilst his collection of drawings had by then run up to about 900 plates. In the almost complete absence of specimens, and considering the shortness of the diagnoses, there was great danger that most of his new species and genera would remain obscure: but, seeing that he himself should not be able to reap the full fruits of his almost lifelong work, he generously handed the bulk of his drawings over to his more fortunate rival,

Professor A. Cogniaux, who had been entrusted with the elaboration of the *Orchidaceae* for Martius' *Flora Brasiliensis*. They were very largely used for the illustration of that work, and Barbosa Rodrigues' share in this field was thus, after all, recognised and secured. Through the good offices of Professor Cogniaux, Lady Thiselton-Dyer was enabled to copy, for the Kew collection, a set of about 550 of Barbosa Rodrigues' coloured original drawings, one of the finest contributions of this kind within a single order.

Barbosa Rodrigues was more fortunate with his monograph of the Brazilian palms. The first impulse to it was given when, in 1872, he was commissioned by his Government to continue Martius' studies of the palms of Brazil. He took the task up with his usual enthusiasm, working almost entirely from the standpoint of the field botanist, studying, analysing, and drawing on the spot. For a long time it seemed as if his work would not be recognised and would share the fate of his Iconographia of the *Orchidaceae*, but at length, in 1902, he had the great satisfaction of a special vote being passed by the Brazilian Congress for the publication of his *Sertum Palmarum Brasilianarum*. He himself came to Europe and superintended the printing at Brussels. It consists of two large folio volumes of 140 and 110 pages of text and 91 and 83 coloured plates, and contains descriptions of 42 genera and 382 species, of which no less than 166 are credited to him as author. The originals for the plates were all drawn by himself, often with a delicacy to which the prints hardly do justice. He was a fertile writer, and his publications deal not only with botany but with many subjects pertaining to archaeology, palaeontology, ethnography, and the Indian languages.

O. S.

Caraipa africana.—In 1868, Oliver described under this name a doubtful specimen collected by Baikie in the Niger region (Fl. Trop. Afr., vol i., p. 172). *Caraipa* is a genus of *Ternstroemiaceae*, and was previously known only from Tropical America, but this presented no phytogeographical difficulty, as it is well known that there is a strong common element in the floras of West Africa and Tropical America (*see* Engler, Fl. Verw. Trop. Afr. u. Amer.). Subsequently, however, as appears from a note on the herbarium sheet, Oliver referred *C. africana* to the family *Dipterocarpaceae*, but without suggesting a genus; and it has now been identified as *Monotes caloneurus*, Gilg.

Monotes was described in 1868 by A. De Candolle, who included it in the *Dipterocarpaceae*, while recognising it as an aberrant type. It was afterwards referred to the *Tiliaceae* by Heim and Pierre, but was finally restored to the *Dipterocarpaceae* by Gilg (Engl. Jahrb., vol. xxviii., p. 134).

The identification of *Caraipa africana* with *Monotes caloneurus* rests on comparison with Schweinfurth's No. 4272, from Djur Awet, quoted without number by Gilg. Schweinfurth's No. 2678 and Baum's No. 925, which Gilg also refers to *M. caloneurus*, seem rather different.

T. A. S.

Botanical Magazine for April.—The plants figured and described are : *Impatiens Hawkeri*, Bull ; *Microloma tenuifolium*, K. Schum. ; *Arbutus Menziesii*, Pursh ; *Strophanthus Preussii*, Engl. and Pax ; and *Anthurium trinerve*, Miq. *Impatiens Hawkeri*, a native of Eastern New Guinea, was first brought into commerce in 1886, having been introduced by the late Mr. W. Bull of Chelsea. This and the closely allied *I. Herzogii*, K. Schum., are the only species at present known from the island, though it is estimated that in Asia and its islands there are altogether about 500 species. The two named are the most easterly representatives of the genus in Asia. *Microloma* is a genus of Asclepiadaceae which comprises ten species, all of which are confined to South Africa. *M. tenuifolium*, known as the Coral Climber of South Africa, has very slender twining stems, linear leaves, and lax umbels of small crimson wax-like flowers. The specimen figured was grown in Mr. Gumbleton's garden at Belgrove, near Queenstown, Ireland. *Arbutus Menziesii* was introduced into this country as long ago as 1825, when David Douglas sent seeds from Western North America to the Horticultural Society of London. It sometimes develops into a large tree, reaching in California upwards of 100 feet in height. The finest Kew specimen is about 20 feet high, with a short trunk four feet eight inches in girth, and a wide-spreading head. The *Strophanthus* is a West African species, which is illustrated from a specimen raised at Kew from seeds communicated by Mr. W. H. Johnson in 1902, when he was Curator of the Botanic Station at Aburi, Gold Coast. The lobes of the yellowish-white or pale orange corolla taper at the apex into filiform crimson appendages, which are as much as a foot in length, and give to the plant a most extraordinary appearance. *Anthurium trinerve* is noteworthy from a gardener's point of view on account of its free production of spikes of pretty lilac fruits, which are certainly attractive. It is a native of Brazil and Guiana, and has for many years been in cultivation at Kew.

Botanical Magazine for May.—*Dendrobium Bronckartii*, Wildem., is a recent introduction from the Mountains of Annam, Indo-China, and the plant figured was purchased in 1906 from Mr. Verdonck of Ghent. It resembles the well-known *D. thyrsiflorum*., Reichb. f., but it is larger in growth, the racemes are larger and laxer, and the flowers are light rose-coloured, with a large orange blotch on the disk of the lip. *Larix occidentalis*, Nutt., of Western North America, has been figured from a specimen growing at Kew which was received in 1881, as a seedling, from the Arnold Arboretum. It has now reached a height of 36 feet, and the trunk near the ground measures 26 inches in girth. Though it has proved too tender for successful cultivation at Weenen, in North-West Hanover, it is quite hardy at Kew, and hopes are entertained that it will become a valuable forest-tree in this country, as a substitute for the European Larch, which has suffered considerably in many districts from the attacks of *Peziza Willkommii*. *Mussaenda Treutleri*, Stapf, is an old garden plant, but appears under the erroneous

name of *M. macrophylla*, Wall., from which it is distinguished by numerous characters, amongst them being the more scattered, rougher hairs, larger leaves, broader stipules and larger corollas. It is also known as *M. frondosa* var. *grandifolia*, Hook. f. A native of Tropical Himalaya and Khasia, it is grown at Kew as a stove plant, and owes its attractiveness chiefly to the enlarged white calyx-segments. *Deutzia setchuenensis*, Franch., is one of the several Chinese species which have lately appeared in European gardens, all of them being ornamental free-flowering more or less hardy shrubs. The plant figured is allied to *D. staminea*, R.Br., but has larger acuminate leaves, longer flowering branchlets, and a corymbiform inflorescence. It was presented to Kew in 1897 by Mr. M. L. de Vilmorin. The Himalayan *Pyrus Pashia*, Ham., var. *Kumaoni*, Stapf, is the same as *P. Kumaoni*, Dcne. Typical *P. Pashia* has densely cottony leaves and calyces ; the variety here named is glabrous or glabrescent, and its calyx-lobes are usually more broadly triangular and less produced at the apex. It has long been in cultivation at Kew.

Epacris dubia, *Lindl.*—In March, 1909, a dwarf *Epacris* flowered at Kew which it was impossible to match with any specimen in the Herbarium collection. On referring to published figures it has proved to be identical with the plant figured in the *Botanical Magazine*, at t. 3257, as *E. heteronema*. The plant thus figured was subsequently referred doubtfully to *E. heteronema* as a distinct variety, *subreflexa*, DC., in *DC. Prod.*, vol. vii. 2, p. 762, and the suggestion was there made that it might be a distinct species. In the *Flora Australiensis*, vol. v., p. 239, *E. heteronema*, var. ? *subreflexa*, DC., is not taken up, though Mr. Bentham refers to the figure on which De Candolle's variety was based ; this figure is cited under *E. heteronema*, var. ? *planifolia*, Benth., with the remark that the drawing is "incorrect as to the corolla."

Now that it has been possible to examine again an example of the plant originally figured by Sir William Hooker it is found that the drawing published by him is perfectly accurate, and it further transpires that this plant is not the same as the plant represented by the original specimens of *E. heteronema*, var. ? *planifolia*, Benth. It is altogether distinct from typical *E. heteronema*, Labill., in habit, foliage and flowers, and after careful comparison it appears almost certain that this plant, figured in the *Botanical Magazine*, at t. 3257, is a form of *E. dubia*, Lindl., as figured in the *Botanical Register* for 1846, at t. 38. The flowers of the two seem identical, but the leaves of the *Botanical Magazine* plant are reflexed and the stems are more slender than in the *E. dubia*. It is on this account proposed that the plant figured as *E. heteronema*, Hook. Bot. Mag. t. 3257, not of Labill., be treated as a variety of *E. dubia*, Lindl. (*E. dubia*, var. *subreflexa*, N. E. Br.).

Pouteria suavis, *Hemsl.*—Under the title of "A new fruit from Uruguay" an account of this plant was given in the *Bulletin*, 1906, p. 365, and it was mentioned that steps had been taken to establish

the tree in Mr. Garnier's garden at Bordighera. Through the kindness of Madame Vve. Charles Garnier, of the Villa Amica, Bordighera, we have been placed in correspondence with Sig. Giovanni Lanteri, President of the Società d'Orticultura, E. M. S. della Liguria in San Remo, who has had the experiment of the acclimatisation of *Pouteria suavis* under his charge. In a letter to the Director of March 30, 1909, he informs us that he has grown the *Pouteria* in the gardens of the Villa Garnier since 1906. The seeds, which were received direct from Paysandu (Uruguay) germinated readily, and at the present time 15 plants are flourishing in the gardens; these have resisted two degrees of frost in the open. He also mentions that he has acclimatised *Lucuma neriifolia*, Hook. and Arn. (*Sapotaceae*), which he is in hopes may serve as a "stock" for the *Pouteria*, as it is more hardy and vigorous.

A large consignment of the fruits of *Pouteria* was received at Kew from Sr. E. Frosio, Horticulturist, Salto, Uruguay, some of which were packed in wax and some in moist sawdust. The seeds packed in wax arrived apparently in excellent condition, but the seeds failed to germinate. Of those packed in sawdust a large percentage has germinated, and the plants are now some ten inches high.

Process of cleaning Rice in Lower Bengal.—The following note on this subject has been supplied by Captain Gage, Superintendent of the Royal Botanic Garden, Calcutta :—

"Paddy (unhusked rice) is soaked in cold water for 24 to 36 hours. It is then removed in a large earthen pot 'handy' and boiled with a little water—about half a seer (seer = 2 lbs.) in a 'handy' containing about ten seers of paddy—until some of the grains burst. The grains are then dried in the sun over a mat. The drying process is thought to be completed when the grains inside the husks become hard. The husks are then removed by a wooden machine called 'dheky'."

The details of the subsequent treatment are well known, but the procedure above described is rarely alluded to in detail in works of reference.

Flora of Bombay.—The final part of the second volume of Dr. Cooke's Flora of Bombay completes the first to be commenced of the series of local Floras designed to supply for its different provinces the place filled as regards the Indian Empire as a whole by the Flora of British India. For different portions of the vast area dealt with by Sir J. D. Hooker and his colleagues separate or partial Floras have from time to time been published. The series now begun has been planned on definite lines to revise or supplement the larger work for local areas. The information there placed for the whole of India and Ceylon in a systematic form at the disposal of all interested in the vegetable wealth of those regions is thus being completed and brought up to date.

---

[c] The Flora of the Presidency of Bombay, by Theodore Cooke, C.I.E., M.A.I., LL.D., F.L.S., F.G.S., &c.

The arrangement followed in these local Floras is that of the *Genera Plantarum* of Bentham and Hooker.

The volume before us gives evidence of reliable and thorough work both in the field and with the microscope.

In spite of a warning note by Roxburgh, who was the first to examine the minute structure in *Olea dioica*, it has been authoritatively stated that the female blossoms were devoid of a corolla, but Dr. Cooke shews (p. 118) that in the functionally female flower stamens and corolla are regularly developed ; the corolla falls off early, taking with it sometimes all the stamens, sometimes two out of three ; and he adds the interesting and significant fact that in a few cases a proportion of the stamens spring, not from the floral envelope but from the ovary itself. Under *Nothosaerua* again (pp. 494-495) there is a lucid clearing up of the facts, and, in this instance, of the bibliography as well, which, in the case of Indian plants, is too frequently a formidable item. Characteristic examples of close observation, frequently involving careful and laborious dissections, are to be found in the treatment of such genera as *Sarcostemma* (pp. 158-159), *Ceropegia* (pp. 173, *et seq.*), *Lindenbergia* (pp. 306-307), and of the whole family of *Gramineae*. In matters of nomenclature the same painstaking accuracy is conspicuous,—as under *Bassia* (p. 92), where "Illipe, Koenig" is, let us hope, finally consigned to the limbo of unhappy emendations ; also *Moniera* (p. 285), and *Ardisia solanacea*, Roxb. (pp. 86-87). The cases of the *Ardisia* and of *Diospyros Tupru* (see p. 99), also *Cordia* (pp. 198-202), illustrate a difficulty as regards these local Floras which it is perhaps easier to point out than to remedy, a difficulty which appears in the Flora of British India to begin with, in the later volumes more especially, through the incorporation with the text of critical discussions. It is hardly needful to point out the very obvious inconveniences that result when an author is driven to compress memoirs of this kind within printer's limits and to intersperse them among his descriptions ; but one especially regrettable effect is that those working under such conditions are compelled in practice, in some cases, to accept results embodied in some wider treatment of a family or genus with which they can hardly be themselves in real accordance. Thus, at p. 413, Dr. Cooke has placed a most interesting addition to the Flora of Bombay under "*Monechma*, Hochstetter" as set out by the late Mr. C. B. Clarke in the *Flora of Tropical Africa*, vol. v., p. 214 ; but the genus *Monechma*, as conceived by that authority, is not Hochstetter's genus, nor did Hochstetter, strictly speaking, separate his genus *Monechma* from *Justicia* on grounds recognised by any subsequent botanist ; it would seem almost as if he had assumed the plant brought from the Nile basin by Kotschy (No. 261 Kotschy) to have been a novelty, whereas, rightly or wrongly, it has been, by subsequent consent, identified with *Justicia debilis*, Linn. Further we have no means of knowing, without critical study of the material at Kew and elsewhere, to which of the half-dozen or so of Clarke's varieties (at least two of which are pretty certainly good species) of "*Monechma bracteatum*, Hochstetter," the Porbandar plant is to be attributed, although interesting questions of phytogeography are raised by this striking

illustration of the links that connect the coast and desert flora of Western India with parts of East Africa and the sub-tropical Nile Valley.

Where Dr. Cooke has allowed his own judgment to prevail, the results suggest that, at times, respect for justly esteemed authority has carried too much weight, as when, for instance, at p. 273, following the Flora of British India and other standard works, the seeds used by the roadside poisoners of India are attributed to *Datura fastuosa*, Linn., var. *alba*, C. B. Clarke, which is *D. alba*, Nees von Esenbeck. The plant of Nees is specifically distinct from *D. fastuosa*, and the name appears to have been given not with reference to the colour of the flower, but for other reasons ; but in any case the seeds ordinarily, if not always, used by the professional "poisoners," are neither those of *D. alba* nor of *D. fastuosa*, but of *D. Metel*, Linn., a native of Central America, now widely diffused in the dry sub-tropics from Birma to North Africa, and extending to the northern shores of the Mediterranean. One or more species of *Datura* were used long ago in parts of what is now the Bombay Presidency, although not by thieves, for criminal purposes ; but the art of the road poisoner, and most of the "Thugs" who practise it, are alike imported from North-Western India, where *Datura Metel*, to which the moister parts of India are unsuited, flourishes in the Punjab ranges, and the low outer Himalaya more especially. Similarly a tradition which finds place in the *Flora of British India* that many plants supposed to have been collected in Sind by Stocks or by Vicary were actually found west of the somewhat hazy frontiers of Beluchistan has been if anything too religiously followed, with the result that so typical an Indus Valley plant as *Arnebia Griffithii*, Boiss., is marked as a doubtful inhabitant of that Province. It is quite true that when Col. Perronet Thompson sent the seeds from which the type of the picture in the *Botanical Magazine* (t. 5266) was raised, his regiment had its headquarters at Sialkot, on the Kashmir border; but the "prophet's flower" does not grow within many scores of miles from that station, and in spite of the defective material in this country, its occurrence between the right bank of the Indus and the frontier hills of Northern Sind may be assumed with certainty.

Of the general accuracy of the nomenclature throughout this work it is needless here to multiply examples, but the wholesome rule hitherto followed in these local and Colonial Floras of using that specific name which is the oldest under the genus to which the plant is referred seems to have been varied in part of the work. Otherwise, it does not appear why at pages 572 and 573 "*Bridelia retusa*, Spreng." and "*B. stipularis*, Blume," should have supplanted *B. spinosa*, Willd. (assuming that this is identical with Sprengel's "retusa") and *B. scandens*, Willd.

Besides, if we are to set aside the arguments, on this vexed question, of Alph. De Candolle—which are at the same time oftener ignored than met, not to say answered—why not "*Briedelia retusa*, Linn." ?, for the credit, or otherwise, of having devised that not very happy trivial name belongs to Linnaeus. The criticism under *B. Hamiltoniana*, on the identification in *Bengal*

Plants, p. 92, of *B. Hamiltoniana*, Wall., Cat. 7882, with *B. montana*, Willd., is so far justified that we have no means of learning without reference to Willdenow's Herbarium whether his *montana* is the same as Roxburgh's *montana*. Pending the appearance of Gohrmacher's work on this perplexing genus, it is chiefly guess-work matching any *Briedelia* with at least the older descriptions; but the very marked form from the Western Ghats which has been written up by some one in the Kew Herbarium as "*B. Hamiltoniana*," seems altogether different from Roxburgh's *montana*, and is not improbably an endemic and so far undescribed species. At p. 47 we cannot quite reconcile ourselves to "*Artemisia parviflora*, Buch.-Ham., ex Roxb. Hort. Beng." In the first place, although it may seem a very minor point, the correct citation of Francis Buchanan's labours might have been followed. That eminent worker's patronymic was Buchanan, which in later life he formally exchanged for the surname of Hamilton. He should, therefore, be quoted as "Buchanan, (afterwards Hamilton)" or for the latter period as "Hamilton (formerly Buchanan)"; it might possibly be just and convenient to refer to him for the purposes of natural history as Buchanan simply, but "Buchanan-Hamilton" or "Hamilton-Buchanan" he never was, and both these forms are objectionable. In this case the citation falls to the ground anyway, because, much as we may regret it, the *Hortus Bengalensis* does not properly fulfil the requirements of a systematic publication. It is more important, however, to observe that *A. parviflora*, Roxb. is identical with the *A. japonica* of Thunberg, in Fl. Jap. 310 (1874), which in any case had priority, so that Thunberg's name should be adopted for this widely diffused and, for an *Artemisia*, little varying species.

The author is to be heartily congratulated on the completion of this eminently useful account of the flora of a highly interesting and only partially explored part of the Empire. It is impossible within present limits to deal with the plants he has put before us, in a series of most excellent descriptions, as regards their distribution and their economic aspects; but as regards the latter, mention should be made of the carefully framed and very lucid keys that are prefixed to the more intricate or extensive genera, as well as those intended to assist students or beginners in finding the genus of a tree or herb under its family. The analysis of *Labiatae* (p. 438), that of *Euphorbiaceae* (p. 558), and, among genera, those under *Heliotropium* (p. 206), *Ficus* (p. 643), and *Eragrostis* (pp. 1021–1022), furnish examples. It remains only to add that this volume is concluded by a thoroughly clear and reliable index, and that the publisher deserves the thanks of all those who will use it for the format of the book and its freedom from typographical blemishes.

J. R. D.

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 6.] [1909.

XXX.—EFFECTS OF THE WINTER ON TREES AND SHRUBS AT KEW.

W. J. Bean.

The winter of 1908–9 was the severest that has been experienced in the British Isles since 1894–5, and the resulting damage to trees and shrubs grown out of doors has been greater than that of the intervening 13 winters all put together. Experiments are continually being made at Kew as to the hardiness of new or untried trees and shrubs, and it is not until such a winter as the last occurs that their real powers of resisting cold are ascertained. The results, therefore, of a severe winter, although often chastening, are not without value; and it is thought that a few notes relating to the more interesting losses and survivals may be useful. As a matter of fact the list of survivors tells a more serviceable and reliable story than that of the losses. The fact that a certain plant has survived uninjured a certain degree of cold without artificial protection hall-marks it with a corresponding degree of hardiness in the particular place where it grows. But one cannot assume so positively that another plant which has died under the same conditions is correspondingly tender. So much depends on attendant circumstances. Its death may be due to a series of adverse conditions of which the winter's cold is but the culminating one.

It must be admitted, however, that the damage done to vegetation during the winter of 1908–9 was not due so much to long spells of intense cold as to violent alternations between intense cold and unseasonable warmth. The month of October, 1908, was extremely mild, often even summerlike. The thermometer rarely fell below 42° Fahr., and on five occasions it rose to between 70° and 80° in the shade. The consequence of this was, that many shrubs, more especially young and vigorous ones, kept on growing when they should have been consolidating ("hardening off") the growth already made. From the end of October to December 27, the weather continued very mild, and frosts, ranging from 1° to 8°, were registered on six occasions only. But on December 28 the minimum temperature was 24° Fahr.; on the 29th it was 23° Fahr.

(13507—6a.) Wt. 108—471. 1375. 7/09. D & S.

with a heavy fall of snow; and on the 30th the thermometer fell to 10° Fahr. It was, no doubt, to this sudden experience of 22 degrees of frost, following a long period of soft mild days, that much of the damage we have to record was done. On the night of the following day (December 31) it was thawing and raining. The first three weeks of the new year were very mild, but during the last week of January frosts varying from 6 to 12 degrees were registered. February opened mild—on the night of the 3rd the minimum temperature was 51° Fahr.—and continued so until the third week. This had excited some plants, especially Siberian and Manchurian ones, into a premature activity, when the second spell of severe weather occurred. This lasted from the third week of February to the second week of March. On two occasions 13 degrees of frost were registered, and once 18 degrees, these being accompanied by bitter E. and N.E. winds and snowstorms.

From this brief summary it will be seen that the winter has no claim to rank among the severe ones of history. So far as the average mean temperature of the six dark months is concerned, it would probably even be found to rank with the warmer ones. The disasters to vegetation that have occurred are undoubtedly due to that characteristic of English winters (exceptionally pronounced in this instance) which is the bane of all cultivators of extensive collections of hardy exotic plants. This consists, as has already been observed, in violent fluctuations of temperature, which bring about in many plants a state of unrest absolutely opposed to the long winter sleep so many of them enjoy in their native places.

It would serve no useful purpose to go through the full list of killed and injured plants. There are some half-a-dozen great areas whence we obtain the more tender shrubs we attempt to cultivate in the open air, viz., S. Europe, Himalaya, New Zealand and Tasmania, S. America, California, and the S. United States. Among such plants are many which can only be said to exist on sufferance in our gardens, but whose interest or beauty is so great that we are willing to risk their occasional loss; for example, the Ceanothuses, Tree Heaths, Cistuses, Escallonias, New Zealand Veronicas, and (on walls) the Myrtle, Olive, and Pomegranate. These can only be expected to pass through the mildest winters unharmed, and their experiences during the past winter have not differed from those of ordinary winters except in being somewhat more unfortunate than usual. Some shrubs, too, which are indisputably hardy, such as *Cytisus albus*, have had their younger branches killed, owing no doubt to the soft, unripening weather experienced right up to Christmas. These are not mentioned, for the damage is but temporary. The following notes are only intended to record the behaviour of newer and more interesting plants.

New Chinese Plants.—One of the most interesting elements in the horticulture of the present time is the introduction of new plants from Western and Central China. Most of these, it is hoped, will prove hardy enough to take a permanent place in the outdoor garden, and although the last winter can scarcely be said to have afforded the supreme test of our English climate, the results are full of encouragement.

It is especially satisfactory to find that *Davidia involucrata*, for which we are indebted to the enterprise of Messrs. Veitch, has not been injured by cold, even to the extent of a single bud. So much could not be said of several British plants. *Ailanthus Vilmorinii*, although young and only 2 feet high, is unscathed. In the low damp ground behind the Palm House, *Rhododendron rubiginosum* was killed by the rupture of the bark near ground level, but on the higher, drier ground near King William's Temple was unhurt, and has flowered well since. *Jasminum primulinum* was killed to the ground even against a wall, and appears to be of no value for outdoor cultivation. *Magnolia Delavayi*, destroyed in the open ground, is unhurt on an east wall. Several young plants of *Poliothyrsis sinensis* were killed in the nursery, but others are growing well. *Poupartia Fordii*, has survived. The following rare Chinese trees and shrubs, growing in the open ground without any protection, were quite unaffected: *Liriodendron chinensis*, *Euptelea polyandra*, *E. Francheti*, *E. Davidiana*, *Tetracentron sinense*, *Eucommia ulmoides*, *Pertia sinensis*, *Sycopsis sinensis*, *Eleutherococcus Henryi*, *Berberis Wilsonae*, *B. dictyophylla*, *B. acuminata*, *Trachelospermum crocostomum* (on a wall), *Cotoneaster adpressa*, *C. applanata*, *C. moupinensis*, *C. humifusa* (seedlings were injured), *C. bullata*, *C. rugosa* var. *Henryi*, *Viburnum Carlesii*, *V. rhytidophyllum*, *Rosa Hugonis*, *Itea ilicifolia*, *Schizophragma integrifolia*, *Sinofranchetia sinensis* and *Sophora viciifolia*.

A great number of plants have recently been raised from seeds presented to Kew by Prof. Sargent which had been collected by Mr. E. H. Wilson during his last journey in China. Nothing definite can be put on record about them because most of them are unnamed and under numbers only. Further, they had only been planted in the open ground a few months. Most of them, however, have survived, although many have been cut back to ground level.

Coniferae.—This family, as represented in the outdoor garden, is, of course, but little affected by the severest frosts. It is only a few of the uncommon species that need be mentioned. *Libocedrus macrolepis*, a new Chinese species, is killed. *Podocarpus alpina*, a species native of Tasmania, and *P. chilina* from Chile have suffered very little. *Fitzroya patagonica* and *Libocedrus chilensis* are untouched. Of the commoner sorts, *Pinus insignis* was the only one that showed much evidence of damage, and this was confined to its leaves, which remained on the trees but turned a curious rusty brown.

Bamboos.—These afford the worst evidence in Kew of the winter's havoc, and the appearance of the Bamboo Garden at the time of writing (June) makes one doubt whether a large portion of the species are really worth a place in ornamental gardens. Not a single species probably has been killed or even permanently injured, but the top growth of many is entirely dead, and only the underground rhizomes are alive. Others, which on Christmas Day last constituted some of the freshest and certainly most graceful masses of greenery in the gardens, are now leafless stems with no more beauty than a bundle of pea-sticks. And the worst consequence of a season like the past one is, that, so late are Bamboos in renewing

their growth, it is not until after midsummer that they become presentable again. The two most satisfactory species are *Arundinaria nitida* and *A. fastuosa*, which have not suffered in the least. Many of the *Phyllostachys* have been lost to the collection in recent years owing to their flowering and subsequent death. Of those that remain, *P. flexuosa*, *P. nigra*, and *P. Quilioi* have suffered less than any. A curious fact in regard to *P. viridi-glaucescens* is, that the only specimen which has escaped damage is growing on a dry slope. The old *Arundinaria japonica* (commonly known as *Bambusa Metaké*), which on account of its hardiness has been planted about the grounds, is very much disfigured. Among the dwarf species, *Arundinaria pygmaea*, *A. Kumasasa* (or *palmata*), *A. Veitchii*, and *Bambusa tessellata* are but little affected.

Rhododendrons.—Perhaps the most interesting result among Himalayan Rhododendrons is the indifference to the recent winter's cold shown by *R. barbatum*. Some plants, now 6 feet and upwards high, presented to Kew by Sir J. T. D. Llewellyn a few years ago and planted in the Rhododendron Dell, have come through quite unaffected and have flowered this spring. The following N. Indian species also may now be regarded as hardy at Kew :—*Anthopogon*, *arboreum* (var. *Campbelliae*), *campanulatum*, *campylocarpum*, *ciliatum*, *cinnabarinum*, *fulgens*, *glaucum*, *lepidotum*, *niveum*, and *Thomsonii*. *R. triflorum* has almost perished.

Among the Japanese and Chinese species the only total loss is the recently introduced *R. sublanceolatum*. In a low-lying situation *R. rubiginosum* has succumbed, and *R. yunnanense* has lost its foliage. Several forms of the Indian Azalea (*R. indicum*) have flowered exceedingly well in spite of the winter, and there seems to be a promising future in gardens for several small-leaved, hardier sorts. *R. indicum* var. *amoenum* has been grown unprotected at Kew for more than 20 years, and in 1893, Prof. Sargent introduced from North Japan the variety *Kaempferi* which blossoms well every year. Since then several other unnamed forms have proved equally hardy. A set of new Chinese species was received from Messrs. Veitch last year, but, protection having been afforded them, nothing definite can be said of their cold-resisting powers. Judging, however, from the plants in the open air in the Coombe Wood Nursery, it is late spring frosts rather than winter cold that have to be dreaded. *R. serpyllifolium*, a small Japanese species, has suffered badly, but *R. dilatatum* and *R. rhombicum* have flowered splendidly this spring. *R. Fordii* is much disfigured.

South American Plants.—It is interesting to find that the two species of Beech introduced from Chile by Mr. H. J. Elwes in 1902, viz., *Fagus antarctica* and *F. obliqua*, have been absolutely unaffected. Both are deciduous; but their naturally evergreen ally, *F. betuloides*, has lost all its foliage, and although not killed, is apparently unadapted for the open air at Kew. *Lomatia obliqua*, an evergreen shrub also introduced by Mr. Elwes in 1902, has withstood the cold very well in a recess of the wall of the Himalayan House. *Rhaphithamnus cyanocarpus* on a south wall is apparently killed, and *Schinus Bonplandianus* from Brazil is cut back to ground level. *Azara microphylla* is one of those shrubs

whose young branches are all killed, but it is breaking freely from the older wood. Of Fuchsias and Escallonias there is nothing unusual to record; all the former, and several of the latter, have been cut back to the ground even on walls, but as in former years will spring up again. *Buddleia globosa* is killed down to the old stems, but is rapidly recovering.

Californian Shrubs.—Of the tall-growing Ceanothuses, *C. thyrsiflorus* has proved the hardiest, although the large specimens, 15 feet or so high, which have made a remarkable feature for so long near the Broad Walk, are badly hit. They will, no doubt, quite recover. None of the species on the walls, such as *Veitchianus*, *rigidus*, *integerrimus*, etc., have been killed, but some have suffered. *Dendromecon rigidum* has perished even against a south wall. *Fremontia californica*, in one of the recesses of the outer wall of the Temperate House, is perfectly healthy and now in flower. *Umbellularia californica*, quite in the open, is untouched.

New Zealand Shrubs.—*Plagianthus Lyallii*, of which there was a fine bush 10 feet high in the collection of shrubby Malvaceae, was destroyed right to ground level, but against a wall it is untouched. The tenderness of this beautiful species is unfortunate; for several years past it has flowered profusely and late in the season, when few other shrubs are in blossom. *P. pulchellus* succumbed even against a wall. *Griselinia littoralis*, whilst it withstood the December frost apparently unaffected, was badly cut up by the biting winds of early March. It cannot be regarded as a dependable evergreen at Kew, in spite of all that has been said in its favour. *Sophora tetraptera* perished in the open, but not under the protection of a wall. The effects of the inclement winter on Veronicas—which constitute the most important group of New Zealand shrubs we can grow out-of-doors—have not been particularly marked, nothing like so disastrous as in 1895. About 10 species were killed or injured very severely, but as their susceptibility to cold is well known a set of cuttings is rooted each year and kept under protection in order that, if necessary, they may be renewed. An old plant of *Muehlenbeckia adpressa* was killed back to ground level.

Heaths.—These shrubs succeed well as a rule in Kew, and are much valued for producing broad masses of colour in spring and autumn. Apart from the British species, the hardiest of all have proved to be *Erica stricta* and *E. arborea* var. *alpina*, both of which remained fresh and green even to the smallest and youngest twigs. *E. mediterranea* is untouched except for the young succulent growths made late last autumn. *E. australis* is mostly killed to the ground; *E. lusitanica* and *E. arborea* were rendered very shabby; and *E. Veitchii* (a hybrid between the two latter) suffered more than either, probably because of its fast-growing habit. All the other species, native and exotic, that are mentioned in the Kew "Hand-list of Trees and Shrubs" were uninjured.

Cistuses, etc.—We have long regarded *Cistus laurifolius* as the hardiest species of this genus, and last winter confirms this view. The following have also survived:—*C. corbariensis*, *florentinus*, *lusitanicus*, *recognitus*, and *salvifolius*. *C. cyprius* is badly hit, but

is now breaking freely from the base. These species are evidently the most desirable members of this beautiful genus to grow where no protection can be afforded. Of Helianthemums, *H. alyssoides*, *formosum*, *ocymoides*, and *vineale* have survived, but *H. halimifolium* is nearly swept away and *H. umbellatum* has almost disappeared.

An interesting—and to me unexpected—result is the passing through the winter of *Magnolia Campbellii* quite uninjured. Plants were killed in 1895. Two Madeiran shrubs, *Genista virgata* and *Vaccinium padifolium* (*V. maderense*), are grown in the open air here. The former is so hardy as to be naturalising itself about the grounds, and a plant of the latter has grown just inside the Main Entrance for at least 65 years. Sir Joseph Hooker believes it to be the original plant introduced by Francis Masson on his return from South Africa in 1777.

The exceedingly rare *Elliottia racemosa*, of which there are two plants at Kew, has not been affected in the least, although a native of Georgia. *Diospyros Kaki*, uninjured on a wall, succumbed in the open.

In a general way old and well-established shrubs with stout woody stems withstand a severe winter better than younger and more succulent ones. But there are curious exceptions. For instance, all our old specimens of *Veronica Traversii* have been crippled beyond recovery, but young two- or three-year-old plants are scarcely touched. And the only plants of common Rosemary remaining after the winter are plants two years old; all the older ones having perished. A similar result was noted at Kew in 1895 in regard to *Daböecia polifolia*, young plants surviving when old ones were destroyed.

Raphiolepis ovata, usually confined in greenhouses, is in perfect vigour in spite of the trying winter. *Choisya ternata*, remarkable in being a Mexican shrub, hardy near London (perhaps the only one), was rendered rather shabby in foliage, but flowered excellently in May.

Evergreens.—A curious feature of the winter has been the number of habitually evergreen trees and shrubs which lost all, or nearly all, their leaves, but were not otherwise injured. The most striking instance at Kew is furnished by the Holm Oak (*Quercus Ilex*). Many trees—but far from all—were quite defoliated. *Osmanthus Aquifolium* dropped all its leaves, whilst its reputed variety *ilicifolium* retained them. Of the newer Chinese shrubs *Cotoneaster angustifolia* and *Rhododendron yunnanense*, both evergreen in ordinary seasons, were this year deciduous. An old and well-known denizen of gardens, *Berberis Wallichiana* became quite bare after the December frost, together with its several varieties except two. One of these, a native of China, sent to Kew by M. Maurice de Vilmorin, is a charming shrub of low, dense, rigid growth, with leaves vividly white beneath; it is quite unharmed. The other, also Chinese but introduced by Wilson, is similar to the ordinary Himalayan type in habit; it also retained its leaves. Many Deodars were almost devoid of foliage by the middle of March, and the Phillyreas (except *P. decora*) were scarcely recognizable in their almost leafless condition.

One rather striking accompaniment to the denudation of these evergreen trees and shrubs was the uplifting of the branches after they had been relieved of their normal weight of foliage. Many of them which ordinarily rest on the ground rose one or two feet from it, and the ends became incurved like the eaves of a Chinese temple, giving the trees a curiously unfamiliar pose.

XXXI.—NOTES ON NEW ZEALAND MARINE ALGAE.

A. D. Cotton.

A number of New Zealand algae have been from time to time examined and identified in the Herbarium, and in the course of their determination several points of interest have come to light. The publication of these will doubtless be of value to students in that country, and in the following notes the results of some recent investigations are given.

Myrionema strangulans, *Grev.*, Scotch Crypt. Flora, vol. v. Pl. 300 (1827). On *Ulva latissima*, D.C., Otago, *Lyall*, March 1850. On *U. rigida*, Ag., West Coast, Algae Muellerianae.

Not previously known from New Zealand. The specimens agree precisely with those found in Europe on the same host.

Leathesia difformis, *Aresch.*, and **Petrospongium Berkeleyi**, *Naeg.*

In the Flora of New Zealand, Harvey does not include *Leathesia difformis*, Aresch., though he refers to *L. Berkeleyi*, Harv. (= *Petrospongium Berkeleyi*, Naeg.) and *Asperococcus sinuosus*, Bory (= *Colpomenia sinuosa*, Derbes & Sol.). The Lyall gathering of the latter at Kew is found, however, to consist of *Leathesia difformis*. As far as can be seen, the specimens differ in no way from the European examples.

The record of *P. Berkeleyi*, Naeg., is founded upon specimens sent by Colenso. The plant has not since been collected in New Zealand, and Laing suggests that Colenso's plant may possibly be referable to *Leathesia difformis*. An examination of the original gathering shows that this is not the case. The type of structure is the same as that of *P. Berkeleyi* of Europe, but the filaments are more slender than in that species. It is probable that the New Zealand plant is specifically distinct from that of Europe, but further material is necessary before a definite statement can be made. Colenso notes that the plant occurred "on tidal rocks near Cape Kidnapper."

Dictyota ocellata, *J. Ag.*, Anal. Algol. cont. 1, p. 68 (1894); Laing, Revised List, Addendum to Part 1, in Trans. & Proc. N.Z. Instit. vol. xxxiv., p. 358 (1901); *see also* vol. xxxii., p. 65 (1899).

It is well known that whilst some 10 or 12 species of *Dictyota* occur in South Australia, only two species have been recorded from New Zealand. Some of the New Zealand records have since been referred to other genera, others again have been questioned, so that Laing in his "Revised List of New Zealand Seaweeds," 1899, p. 65, remarked: "Indeed I am by no means certain that we have in New Zealand any species of *Dictyota*, as it is quite possible

that immature specimens of *Glossophora Harveyi* have been confused with *D. dichotoma*." In 1901 he recorded, however, *D. ocellata* on the authority of J. Agardh.

The presence of a fragment of a true *Dictyota* in a collection of Algae from the Chatham Islands, and also of several New Zealand specimens referred to that genus in the Kew Herbarium, suggested the desirability of an examination of the material available. The result of this examination is given below, from which it will be seen that two, if not three, species are found to be represented in the Kew Herbarium, though at the same time Laing's opinion with regard to *Glossophora* was found to be correct.

Dictyota dichotoma is mentioned by Harvey in the Flora New Zealand as collected by Lyall and Colenso. Lyall's specimens (dredged in 8 fathoms, Queen Charlotte Sound, Nov., 1850) represent a fine large plant with broad segments which branch in a subregular dichotomous manner. The structure is that of a typical *Dictyota*, but the fronds are unfortunately sterile. The plant does not appear to agree with any of the known broad-fronded Australian species, and it probably represents an undescribed species. Colenso's gathering (Hawke's Bay) consist of two species, one is *Dictyota ocellata*, J. Ag., and the other possesses the three-layered frond of a *Glossophora*, and doubtless represents young plants of *G. Harveyi*, J. Ag.

In the Hooker collections in the Herbarium there are specimens collected by Sinclair (Bay of Islands, Sept., 1841). The plants are too fragmentary for a definite opinion to be expressed, but from the disposition of the tetraspores the species is evidently closely allied to the European *D. dichotoma*, if indeed it is not identical with it.

Callophyllis Hombroniana, *Kütz.*, Spec. Alg., p. 746, pro parte (1849). *Rhodymenia Hombroniana*, Mont., Prod., p. 3 (1842); Voy. Pol. Sud., p. 157, tab. 1, fig. 2 (1842–5); non *Callophyllis Hombroniana*, Kütz. in Harv. et Hook. Crypt. Antarct., nec in Flora New Zealand. *Callophyllis erosa*, Harv. Fl. New Zeal., vol. ii., p. 250 pro parte, Pl. 118, fig. 1, 3, 4 (1855).

In New Zealand some uncertainty exists as to the identity of *Callophyllis Hombroniana*. Montague's beautiful figure (Voy. Pol. Sud. l.c.) gives an excellent idea of the plant, and the large number of specimens that exist in British herbaria indicate that the species is of common occurrence. Harvey's conception of the plant was incorrect, he having confused it with another species, *C. callibleph-aroides*, J. Ag., an error pointed out by J. Agardh (Epic, p. 231). Harvey, however, as explained below, figures it well in the Flora of New Zealand.

It has been already pointed out in the Kew Bulletin (1908, p. 162) that the original gathering of *Callophyllis erosa* consisted of more than one species, a fact which explains the character of the published figure and description. Figure 2 of Pl. 118 in the Flora of New Zealand has long been known to represent *Craspedocarpus erosus*, Schmitz (= *Rhodophyllis erosus*, J. Ag.), whilst the remaining figures have been either left as depicting *Callophyllis erosa*, Harv., or referred to *C. Hombroniana*. Considerable uncertainty, however, exists, and De Toni omits all reference to the figures. From an

examination of the specimens it is perfectly clear that *Callophyllis erosa* cannot exist as a species, part of the original gathering being composed of *Craspedocarpus erosus*, Schmitz, and the remainder (with the exception of an indeterminable fragment) of *C. Hombroniana*. The specimen depicted in figure 1 is in the Kew Herbarium, and is a typical, though somewhat worn, example of the last named plant, and figures 3 and 4 refer also to the same species.

The following is a revised description of *C. Hombroniana* :— Fronds narrow, much branched, rather large, deep crimson. Root small, discoid. Main branches 5–8 mm. wide, erect or spreading 20–25 cm. long, irregularly dichotomous, and pinnately beset with branched laciniae, or lateral branches. Lateral branches short, repeatedly and irregularly dichotomous ; margins laciniate. Laciniae short, almost simple or much branched. Cystocarps single in the segments of simple or slightly branched laciniae. Tetrasporangia in terminal segments of lateral branches and in densely branched laciniae, cruciately divided, 40 × 20μ.

Distinguished from *C. calliblepharoides* by the longer narrower fronds and much branched laciniae. The Tasmanian *C. Lambertii*, Harv. which *C. Hombroniana* most closely resembles differs in the ancipate frond, coarser and thicker lateral branches and absence of fimbriae ; whilst *C. coccinea* may be known by the much narrower branches, absence of fimbriae and by the long dichotomously branched lateral branches.

Chrysymenia asperata, *Cotton*, comb. nov.

Callophyllis asperata, Harv. in Hook., Flora New Zealand, vol. ii., p. 250 (1855). *Chrysymenia? apiculifera*, J. Ag., Epic. p. 320 excl. syn. (1876).

Callophyllis asperata, Harv., is little known and has not been lately recorded. An examination of the type specimens in the Herbarium shows that the plant is not a *Callophyllis*, but possesses the texture and structure of *Chrysymenia* ; a striking resemblance was also noted to J. Agardh's New Zealand *Chrysymenia apiculifera*. On comparing it with the original gathering of the latter (part of which is in the Herbarium) the two plants were found to be identical. An alteration of name is therefore necessary.

The tetraspores of the present species are cruciately divided, and there is little doubt that the generic position accorded to it by Agardh is correct, though his ideas were somewhat confused owing to his uniting it with *Nitophyllum variolosum*, Harv. The latter, as stated below, is a true *Nitophyllum*.

Nitophyllum variolosum, *Harv.* in Flora New Zealand, vol. ii., p. 241 (1855).

Clearly described by Harvey in the Flora of New Zealand, this alga was linked by J. Agardh (Epic. p. 320) with his *Chrysymenia apiculifera*. Agardh had not seen authentic specimens, but stated that such a common alga as *C. apiculifera* could not have been unknown to Harvey, and that the plant named *N. variolosum*, with peculiar root-like processes, was probably the same as his *C. apiculifera*. Consequently *N. variolosum* has disappeared from the list of *Nitophylla* and now figures only as a synonym of *C. apiculifera*.

Two of the original specimens collected by Lyall are preserved at Kew, and they clearly show that on this occasion Agardh was in error and that the plant is a *Nitophyllum*.

Though nearly allied to *N. palmata*, the present plant appears to be distinct from any of the species described in that difficult section. The root-like processes, with which both the surface and margin of the frond are beset, give the plant a peculiar appearance, but as these bodies are not always present this character must be used with care. In Britain similar outgrowths are met with upon certain forms of *N. laceratum*, especially those in which procumbent fronds are present, or those in which the fronds are in contact with other algae. The stimulus of contact appears in this species to be capable of bringing about the production of these peculiar attachment organs. From the appearance of the Kew specimens of *N. variolosum* it seems very probable that the same cause might occasion the formation of root-like processes in that species. Harvey's diagnosis precisely describes the Kew specimens and nothing of material importance can be added to it.

As surmised by Agardh, *C. apiculifera* was not unknown to Harvey, but he regarded it as a *Callophyllis*, having named it, as shown above, *C. asperata*. The ciliate processes on that plant bear no resemblance to those on the *Nitophyllum*, but are densely scattered over both surfaces of the fronds and have not the slightest appearance of being organs of attachment.

Nitophyllum uncinatum, *J. Ag.*, Species Alg., vol. ii., p. 654 (1852).

Nitophyllum uncinatum is a very distinct species, but it is one which has become obscured owing to the fact that uncinate branches may be also produced by other species of the genus.

The plant was first described by J. Agardh in 1852. He states that it is not uncommon in the Mediterranean, and was characterised by the possession of acuminate fronds and of occasional uncinate branches; the sori moreover were produced immediately behind the apex of special short branches. Unfortunately, Agardh quoted as a synonym *N. laceratum* var. *uncinatum*, Grev. The latter is a perfectly distinct plant, but the error has been perpetuated. *N. laceratum*, Grev. assumes a large number of forms and the variety *uncinatum*, Grev., is not at all uncommon in the south of England. In the tetrasporic condition there is no difficulty in separating it from Agardh's species, and even when sterile, the straggling habit, the dingy colour, the blunt apices of the frond and well-marked veins are usually sufficient to distinguish it. In Britain *N. uncinatum*, J. Ag., is very rare and *N. laceratum* var. *uncinatum*, Grev., is not uncommon, whilst in the Mediterranean the reverse is the case.

When an examination is made of the Australian and New Zealand specimens of *Nitophylla* a similar state of affairs is found to exist, two distinct species having been referred to *N. uncinatum*, J. Ag. One is a plant which with little doubt is Agardh's species, and the other is an uncinate form of *N. multipartitum* H. and H. The former agrees in form and structure with the European specimens, but up till the present it has only been examined in a sterile state.

With regard to New Zealand, the uncinate form of *N. multipartitum* has not been observed, but *N. uncinatum*, J. Ag., is represented by several specimens.

It may also be mentioned that several seasons' study of the genus *Nitophyllum* on the English coasts has clearly demonstrated that remarkable diversity in form can be exhibited by certain species, *e.g.*, *N. punctatum* and *N. Gmelini*, though the structural characters remain unchanged. The precise conditions that bring about a given form have not yet been satisfactorily determined, but the depth of water and the amount of light are doubtless two very important factors. It is interesting to note that the variations which occur in the European species referred to, are closely paralleled by the Australian species *N. crispum* and *N. affine*. Such observations strengthen the view that not a few of the so-called species from Australia are in reality only forms.

Aphanocladia delicatula, *Falkenb.*, in Engl. and Prantl. Pflanzenfam., p. 444 (1897); *Rhodomelaceen*, p. 288, tab. 2, figs. 15–17 (1901). *Rytiphloea delicatula*, Harv. in Hook. Flora New Zealand, p. 224, pl. 112 D (1855); Laing Rev. List, p. 355 (1901).

A fine tuft of this rare species was forwarded to Kew by Mr. R. H. A. Shakespear from Little Barrier Island. The gathering is interesting, not only as coming from a northern locality, but also that, according to Laing, the plant has not been collected since Lyall's time. The Little Barrier Island plants agree in every way with Lyall's original specimens.

Falkenberg removed the present species from *Rytiphloea* to a special genus *Aphanocladia*. The latter he placed amongst the *Pterosiphoniae*, a sub-family distinguished from the *Polysiphoniae* mainly by the distichous branching. The new position is decidedly more natural. *Aphanocladia* differs from *Pterosiphonia* in possessing only four pericentral cells, and by the spiral arrangement of the tetrasporangia.

With the exception of a record by Reinbold from New South Wales, *A. delicatula*, Falkenb., is only known from New Zealand.

XXXII.—ADDITIONS TO THE WILD FAUNA AND FLORA OF THE ROYAL BOTANIC GARDENS, KEW: IX.

NEMATODA.

Aphelenchus olesistus, *Ritzema Bos*: an eelworm in fern fronds.

Quite recently, conspicuous, well-defined, brown stripes or irregularly shaped blotches, were observed on the fronds of various species of ferns growing under glass. Microscopic examination revealed the presence of eelworms in the diseased patches, which Dr. J. G. De Man, Terseke, Holland, kindly examined and identified as *Aphelenchus olesistus*, Ritzema Bos. This species also causes brown patches on the leaves of species of *Begonia*, *Chrysanthemum*, *Gloxinia*, *Coleus*, *Saintpaulia*, etc.

Dr. Ritzema Bos states that when the air is moist the eelworms migrate from old diseased parts and enter other healthy portions of the frond or leaf, through the stomata, and that when diseased plants are placed in fairly dry air, such migration cannot take place. He further states that dusting the plants with a mixture of tobacco powder and sulphur is an excellent remedy.

The eelworm has attacked *Aneimia collina*, Raddi, *Pteris Droogmantiana*, L. Linden, *Adiantum capillus-veneris*, L., and *Lygodium volubile*, Sw., amongst others, at Kew.

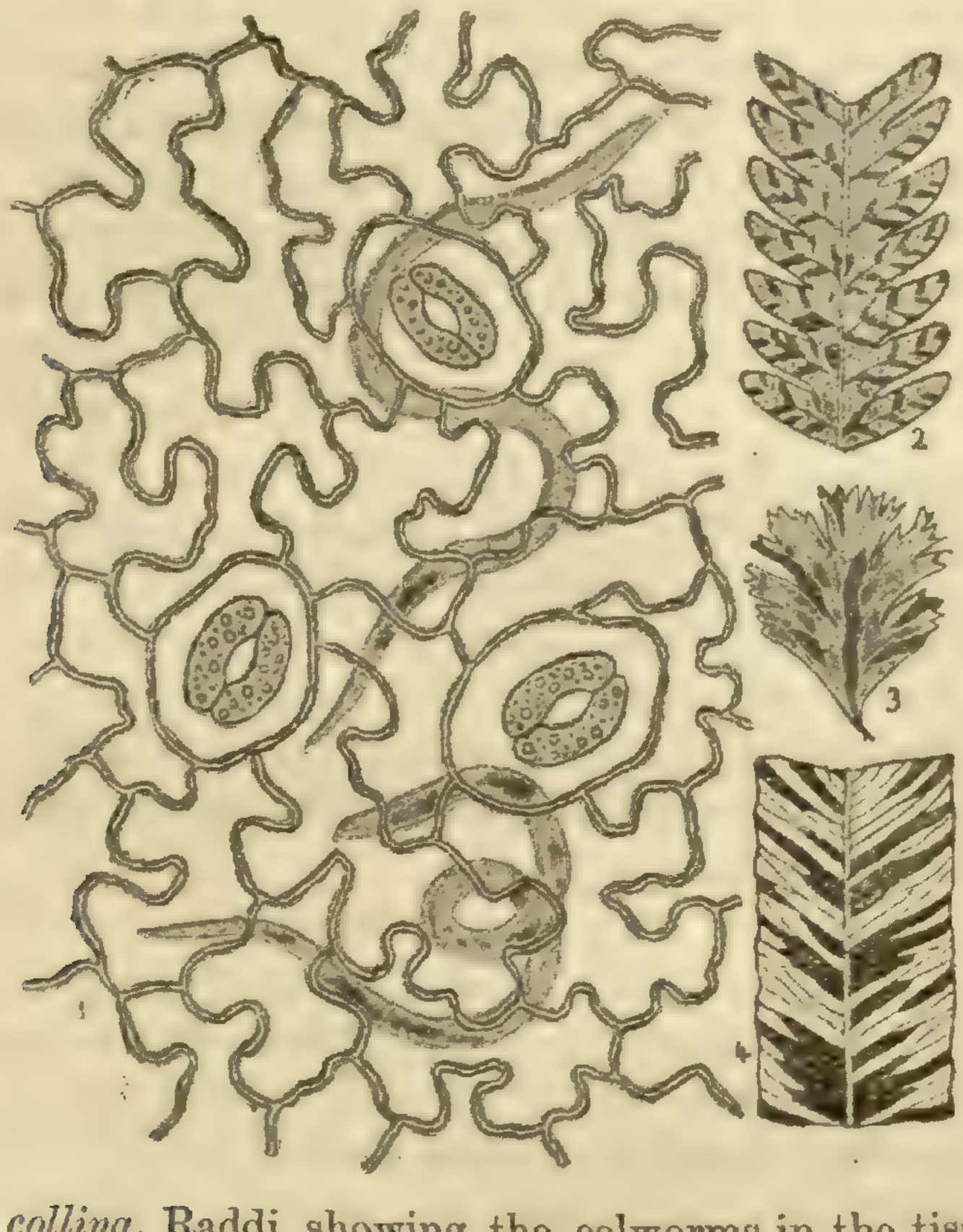


Fig. 1. *Aneimia collina*, Raddi, showing the eelworms in the tissue of the frond under the epidermis × 300.
Fig. 2. *Pteris Droogmantiana*, L. Linden. The dark streaks are caused by the eelworm.
Fig. 3. *Adiantum capillus-veneris*, f. *fissa*, showing dark patches due to eelworm.
Fig. 4. *Lygodium volubile*, Sw., with dark streaks caused by eelworm.

TERRESTRIAL ISOPOD CRUSTACEA.

Richard S. Bagnall.

Five species of woodlice have already been recorded from the Royal Botanic Gardens, Kew, namely, *Trichoniscus roseus*, *Oniscus asellus*, *Porcellio scaber*, *Philoscia muscorum*, and *Armadillidium vulgaris*, but to make the following list as complete as possible these forms have been included.

On December 2nd, 1907, the writer and Mr. H. St. J. K. Donisthorpe spent an hour in the propagating pits in search of ants, beetles, woodlice, etc., and as the results were so satisfactory, returned and collected for the greater part of the following day. Eighteen species of woodlice were obtained and noted, two of which have been described as new, whilst three others await identification. Four of the five species already recorded were more or less plentiful, but *Armadillidium vulgaris* was not met with.

In the following list the references of *Trichoniscus stebbingi*, Patience ; *T. linearis*, Patience ; *T. pygmaeus*, Sars, and *Philoscia patiencei*, Bagnall, are given, as those species are amongst the number of those that have been met with since the publication of Webb & Sillem's "British Woodlice" in 1906.

ISOPODA.

Trichoniscidae.

Trichoniscus pusillus, *Brandt.*

T. roseus, *Koch.*
In several of the houses and pits, and occasionally in the open.

T. stebbingi, *Patience*, *Journ. Linn. Soc.* (*Zool.*), xxx., pp. 42–44, pl. 7, 1907 ; Bagnall, *Ann. de la Soc. Royale Zool. et Malacol. Belg.*, xliii., pp. 127–129, 1908, and *The Irish Naturalist*, Feb., 1909, pp. 42–44.

Numerous specimens, mostly found at the roots of plants in the hotter propagating pits.

T. linearis, *Patience*, *Ann. & Mag. of Natural History*, Ser. 8, vol. i., pp. 280–282, pl. xi., March, 1908.

Described from two specimens, ♂ & ♀, found with *Haplophthalmus daniscus* in one of the cooler houses. *T. linearis* bears a strong superficial resemblance to a small *Haplophthalmus*, both in its appearance and movements.

T. pygmaeus, *G. O. Sars*, *Crustacea of Norway*, ii., p. 162, pl. lxxii., fig. 2, 1897 ; Bagnall, *Ann. & Mag. of Natural History*, Ser. 7, xviii., p. 474, Dec., 1906 ; *Ann. de la Soc. Royale Zool. et Malacol. Belg.*, xlii., pp. 263–266, 1907, and *The Irish Naturalist*, p. 43, Feb., 1909.

Not uncommon in the cooler houses and in the open gardens. Evidently widely distributed in the British Isles.

Trichoniscoides albidus, *Budde-Lund.*
Rare ; three or four specimens from under a board in a cool frame.

Haplophthalmus mengii, *Zaddach.*
A single specimen in one of the propagating houses, Dec. 2nd, 1907.

H. danicus, *Budde-Lund.*
Several in one of the cooler propagating houses, and numerous specimens collected by the late Mr. George Nicholson in the spring of 1908, found under a board lying in the open gardens.

Oniscidae.

Oniscus asellus, *L.*

Philoscia muscorum, *Scopoli.*

Philoscia sp.
A large species of *Philoscia* occurs plentifully deep down in the wet shingle, in the Palm, Fern, and Economic Houses.

P. patiencei, *Bagnall, Ann. & Mag. of Natural History*, Ser. 8, i., pp. 428–431, pl. xviii., May, 1908.

A small species described from specimens found in one of the hottest propagating houses, where it occurs in large numbers amongst the ooze formed beneath a layer of earth and ashes. The species bears a strong superficial to *Trichoniscus pusillus*.

Bathytropa sp.

Several specimens found with a yellow ant, *Wasmannia auropunctata*, in the same propagating house as the above species (*Philoscia patiencei*).

Porcellio scaber, *Latr.*

Porcellio dilatatus, *Brandt.* Not uncommon in most of the pits, and in a heap of vegetable refuse in the open.

Porcellio, sp. A single specimen collected by Mr. Donisthorpe, and probably referable to *Nagurus cristatus*, B.L.

Metoponorthus pruinosus, *Brandt.* This pretty species is not at all uncommon in the cooler houses as well as in the open. In Trop. Fern House; Coll., E. W. Morse.

Armadillidiidae.

Armadillidium vulgare, *L.* Recorded by Mr. Scourfield.

A. nasatum, *B.-L.* Common amongst shingle and at the roots of plants in the Palm and Economic houses, and also in most of the propagating pits.

ARACHNIDA.

Rev. O. Pickard-Cambridge, M.A., F.R.S., &c.

Since the publication of the List of Arachnida found in the Royal Botanic Gardens, Kew (*Kew Bulletin, Additional Series*, V., "Wild fauna and flora of the Royal Botanic Gardens, Kew," 1906, p. 53), I have received some materials from the late Mr. George Nicholson, and more recently from the Assistant Director and others; and, I have much pleasure in recording the additions thus made to this portion of the Gardens' fauna.

It will be seen that these additions are not numerous, and are for the most part, exotic or foreign forms, which have no doubt been introduced in packages of plants or other materials. Some of the foreign forms found in the Gardens are, however, of much interest as being more or less permanently naturalized in the various hothouses and greenhouses, though their interest is considerably lessened by the difficulty and uncertainty as to whence they may have been originally imported. To these additions I have subjoined two or three corrections of synonyms and nomenclature of the former list.

ARANEIDEA.

(*British Species.*)

Pholcidae.

Pholcus phalangioides, *Fuess.* In propagating pits. Coll., H. Ruck. Probably this spider was originally an exotic importation into England, but it may well have existed at Kew before such importations took place there. It is found in great abundance in various localities in the south of England, but generally, if not always in outhouses, old unused lofts and buildings, and in old wood stacks.

Theridiidae.

Robertus lividus, *Blackw.* An abundant species among the débris of old hedges, dead leaves and such like, and widely distributed—a single example from the late Mr. Nicholson.

Entelecara acuminata, *Wider.* A local and rather rare species. Two examples from Mr. Nicholson.

Eperiidae.

Tetragnatha extensa, *Linn.* In Tropical Fern Houses. Coll., E. W. Morse. An adult female of rather unusual size and distinctness of markings. In Fern pits, April 24, 1909. An abundant British spider, but not previously recorded in the Royal Gardens, Kew.

Meda Menardi, *Latr.* In an old decayed elm, Q. Coll., W. Dallimore. A widely distributed but local spider, found in shady, damp places.

Lycosidae.

Pirata hygrophilus, *Thoun.* A single female found in propagating pits. Coll., H. Ruck. A local species usually found on the borders of streams and in swamps among water weeds.

Rectification of Synonyms, &c.

Theridiidae.

Microneta viaria, *Blackw.* (*Kew Bull.* Addl. Ser., V., p. 58.)
Syn.: *Microneta Nicholsonii,* Camb. (*K. B.* Addl. Ser. V., p. 58.)

An examination recently of a large number of examples of *M. viaria,* Blackw., convinces me that *M. Nicholsonii* is only an abnormal variety of it.

Drassidae.

Drassus lapidosus, *Wallk.* (*K. B.,* Addl. Ser. V., p. 54.)
Syn.: *Drassus macer,* Thor.-Camb. (*K. B.* Addl. Ser. V., p. 56.)
Syn.: *Drassus cupreus,* Blackw. (*id.*)

The result of much consideration and examination, both of British and foreign examples, is to convince me of the identity of these three species.

Salticidae.

Panysinus Nicholsonii, *Cambr.*
Syn. : *Hasarius Nicholsonii*, Cambr. (*K.B.*, Addl. Ser. V., p. 63.)
The genus to which this fine showy spider is now relegated is *Panysinus*, Simon. (Histoire Naturelle des Araignees, **2**, p. 802.)

ARANEIDEA.

(*Exotic Species.*)

Oonopidae.

Ischnothyreus velox, *Jackson, Trans. Nat. Hist. Soc. Northumberland, Durham, and Newcastle-upon-Tyne*, n.s., Vol. 3, Part 1, p. 5 ; *see* on pages 9–13, 1908.
This spider was first found in a Kew hothouse in 1907 by Mr. Bagnall, who sent them to Dr. A. R. Jackson. Examples were subsequently found there and sent to me by Mr. H. Donisthorpe. (Proc. Dorset. N.H. & A.F. Club, XXIX., p. 165, Pl. A, figs. 1–6.)
Dr. Jackson had previously received the same species from a hothouse at Alnwick (Northumberland) and had himself found it in warm greenhouses in the Nursery Gardens at Chester.

Diblemma Donisthorpii, *Cambr., Proc. Dorset. & A.F. Club*, 1908, Vol. XXIX., p. 188, Pl. A, figs. 7–13.
Both sexes of this spider were found, and sent to me by Mr. Horace Donisthorpe, in February, 1908. They were discovered in a hothouse among cinders beneath flower pots on the floor, in company with a minute West Indian ant (*Wasmannia auropunctata*, Roger, *see* Fig. 7 of the plate). Both the genus and species were new to science (*see* Fig. 5).

Urocteoidae.

Subgen. Œcobiinae.

Œcobius navus, *Blackw.* (♀ ad.)
An example of this curious little spider was sent to me from the Royal Botanic Gardens, Kew (accompanied by two others, a *Laseola* and a *Lathys*), by Mr. H. Donisthorpe, with the following cue to their probable origin : "Caught on a bundle of imported cork probably from Spain or N. Africa." I had, before receiving this cue, conjectured the *Œcobius* to be Mr. Blackwall's species, whose habitat is Madeira, and this is now made certain by finding in my collection Mr. Blackwall's type specimens.

Dictynidae.

Lathys (Lethia) lepida, *Cambr.* (sp. n. ♀ ad.).
Length 1 line. *Cephalothorax* of normal form, pale greenish-brown, with a dark blackish marginal line and marked with converging dark brown lines, also a largish triangular patch of a similar colour at the junction of the caput and thorax, the anterior angle drawn out into a fine line ending between the hind central pair of eyes. The eyes are rather large and, excepting the fore-central

pair which are much smallest, all of a pearly-white colour; the curve of the hinder row has its convexity directed backwards, and its eyes are almost equally separated by a diameter's distance, the hind-centrals being rather nearer together than each is to the lateral eye on its side. The anterior row is shortest; it is curved, but much less so, in the same direction as the hinder row, and its eyes are very near together; those of each lateral pair are placed obliquely and are almost contiguous to each other. *Falces* strong, straight, perpendicular, and of moderate length. *Legs* short, moderately strong, and not very different in length; similar to the cephalo-thorax in colour, annulated with dark brown, and furnished with coarse bristly hairs. On each of the metatarsi of the posterior pair there is on the hinder side a thin but very distinct calamistrum. The other characters of the fore-part of the spider are normal, and the general colour is like that of the cephalo-thorax. The height of the clypeus is less than the diameter of a fore-central eye.

The *abdomen* is oval, somewhat roundly truncate before, of a black-brown colour above and on the sides, minutely speckled with pale spots (probably not visible except through spirit of wine) rather darkest along the median line; there are two indistinct whitish spots in a transverse line at its fore extremity, from which at about a third of its length is a longitudinal series of four distinct angular white lines, or chevrons, the two middle ones of these are connected at their bases with another short line, forming another angle to each line; some little variation in this would be probably found in a series of examples. A large portion of the underside is suffused or marbled with white. The genital aperture is very distinct and characteristic in its form. The whole abdomen is furnished with hairs, and just in front of the normal spinners, which are rather short, is the cribellum placed transversely and not very conspicuous.

A single example found with *Œcobius navus*, and the following spider (*Laseola*) in the same package of cork, and probably imported with them from Spain. It is a very distinct little species and is nearly allied to, but I think quite distinct from, *Lathys* (*Ciniflo*) *affinis*, Blackw. (Madeira).

Fam.; Theridiidae.

Laseola lugens, *Cambr.*, sp. n.

Adult female length 1½ lines. *Cephalothorax* deep brown, caput paler, prominent in the ocular region and furnished with a few long bristly hairs. *Abdomen* large, broad-oval, a little pointed at the spinners and projecting greatly over the base of the thorax; colour jet black, glossy, thinly clothed with long coarse hairs and spinelike bristles. *Legs* rather short, slender, not greatly different in length, 4, 1, 2, 3; femora black; genuae and tibiae red-brown, with the anterior portion paler; tarsi and metatarsi black; the exinguinal joint of each of the fourth pair, with a portion of the base of the femur, is white and presents, I think, a very distinct character of the species; the tibiae of the fourth pair are of a darker hue than the others. The legs are furnished with coarse hairs and slender spinelike bristles. The eyes of both rows are

strongly curved, the convexity of the curves of both directed forwards ; those of the hinder row are about equal in size and nearly equidistant from each other, the interval being equal to or rather more than an eye's diameter. The four centrals form nearly a square whose posterior is longer than the other sides.

A single example was found in company with the *Œcobius* and *Lathys* above described, and I have a female of it from Lisbon. It appears to me a very distinct species, and on the whole I should be inclined to think that most probably all three species were imported from Spain, as before suggested.

PHALANGIDEA.

Gonyleptidae.

Two examples, which may be of different species or possibly the two sexes of the same species, were received in February, 1909, from Propagating Pits. Coll., H. Ruck. These are still under examination.

THELYPHONIDEA.

Order Thelyphonides.

Tartaridae.

Trithyreus Bagnallii, *Jackson, Trans. Nat. Hist. Soc. Northumberland, Durham, and Newcastle-on-Tyne*, n.s., Vol. 3, Part 1, pp. 28–30, and Part 2, p. 23, Pl. X., figs. 1–5.

♀. Examples of this curious little Arachnid were sent by Mr. Bagnall to Dr. A. R. Jackson in December, 1907, from a hothouse at Kew, and subsequently I received examples from the same locality from Mr. H. Donisthorpe. The family Tartaridae was based by myself many years ago upon examples from Ceylon to which I gave the generic name of *Nyctalops*. The group has since been more thoroughly worked at by the late Dr. Thorell, Prof. H. J. Hansen (Copenhagen), and others, but little is really known about it. (*Cf.* O.P.-Cambridge in Proc. Dors. N.H. & A.F. Club, XXIX., p. 185, 1908.)

ACARIDEA.

Gamasidae.

Gamasus crassipes, *Hermann*. In Herbaceous Ground frames. Coll., W. Irving.

Identified by Mr. Nigel Pearce, of Trinity College, Cambridge. This may have been of foreign importation, but the species is known as British.

HYMENOPTERA.

Formicidae (Ants).

H. St. J. Donisthorpe.

The following species of ants have not been recorded from Kew :—

Prenolepis bruneri, *Mayr.*, sub sp. **Donisthorpei**, *Forel.* (Fig. 6.) This new sub species was recorded in error in my last list (*K.B.* 1908, p. 122) as *P. caeciliae*, Forel. Prof. Forel has now described

I

II

III

IV

V

VI

I

I

I

VII

VIII

IX

I

Herward Dollman
.09.

To face page 251.]

2856.ff. 7286. 48. 1375. 3/29.

Waller & Graham Ltd Litho London

it as above (Bull. Soc. Vaud. Sc. Nat. xliv. 1908, p. 64). It still occurs in the Fern and Palm Houses, and I found it this year in the Lily House. *See* Fig. 6 of the plate.

Prenolepis steinheili, *Forel*, var. **minuta**, *Forel*. Found among Palms from British Guiana by H. Green. A native of the Antilles.

Brachymyrmex patagonicus, *Mayr*. Numerous in the Orchid Houses.

Monomorium minutum, *Mayr*. I discovered this very small species on one plant in the Propagating Pits. It has also been taken this year in the Fern Pits by J. S. Christie.

Camponotus (Colobopsis) truncatus, *Spinola*. (Figs. 1 and 2.) The discovery of this species is of considerable interest. J. S. Christie found *Cremastogaster scutellaris* on some "virgin" cork in the Fern Houses, and bottled, as he thought, four specimens, which were sent on to me. One of the four turned out to be a beetle *Formicomus pedestris*, Rossi! (*See* Fig. 3.) Though very "ant-like" in appearance, it is not a very good mimic of the *Cremastogaster*. I went down to try and get more. I was not successful in this, but I found another species of ant (the *Camponotus*) in some numbers in the cork. The beetle is extremely like this ant in colour, even having the two yellow spots on its black elytra, which are situated on the black abdomen of the ant; moreover, the segments of the ant's abdomen appear to be represented on the elytra of the beetle by white hairs, and the head and thorax of both are red. (*Cf.* Fig. 2, Fig. 1.) The beetle (Fig. 3) is also the same size as small ☿ ☿ of the ant. Large ☿ ☿ occurred with very large square heads. Prof. Forel tells me that there are many mimics among the ants of this genus. Also that *Colobopsis* itself, as well as *Camponotus lateralis*, are held to be mimics of *Cremastogaster scutellaris*. The species is abundant in Algeria.

I also found a Psocus in some numbers in the cork with the ants which Mr. Guermonprez has named for me *Lepinotus inquilinus*, Heyd, and remarks that it is very likely the natural home of this species is in the nests of insects.

Of other Myrmecophiles I may mention that Mr. Bagnall and I saw a specimen of the little Orthopteron (*Myrmecophila prenolepidis*, Wasm.?) among the ants of a colony of *Prenolepis longicornis*, Ltr., in the Propagating Pits, but it escaped, as it can jump very strongly.

Mr. Cambridge has described a little spider (Fig. 5) (*Diblemma Donisthorpei*, Camb. Proc. Dorset. Nat. Hist. & A.F. Club, 1908, p. 188) which I discovered with the little ant (Fig. 7) *Wasmannia auropunctata*, Roger, in the Propagating Pits last year. It was a new genus and species, and occurred in some numbers with the ants, to which it bears a strong superficial resemblance.

Technomyrmex albipes, *Smith*. (Fig. 4.) The ergatoid ♂ ♂ of this ant, mentioned in my last list, have since been described by Prof. Forel (Bull. Soc. Vaud. Sc. Nat. 1908, p. 2). I took a ♀ of this species in the Palm House, 11, ii., 09, the first I have seen.

The ordinary ♂ is figured (*see* plate, Fig. 8, as also the little ant (Fig. 9), *Strumigenys rogeri*, Em., of my last list.

Chalcididae.

Coccophagus flavoscutellum, *Ashmead*, and **Encyntus** sp.? Several specimens taken in Fern House. These little Hymenopterous insects are parasitic on the Coccid *Lecanium oleae*, Brn.

Ichneumonidae.

Triclistus holmgreni. ♀. Taken by H. Ruck in the Propagating Pits; named by Mr. Claude Morley.

COLEOPTERA.

W. E. Sharp.

(*British species.*)

Clavicornia.

Tachinus rufipes, *de G.* In Propagating Pits. Coll., H. Ruck. Common everywhere.

Silvanus surinamensis, *L.* In Propagating Pits. Coll., H. Ruck. A cosmopolitan species found in all kinds of imported produce. Can hardly be considered a member of the British fauna in its strictest sense.

Corticaria pubescens, *Gyll.* In Propagating Pits. Coll., H. Ruck. A not uncommon British species.

Palpicornia.

Sphaeridium scaraboeoides, *F.* In Propagating Pits. Coll., J. Scott. Generally common in the dung of herbivorous animals.

Lamellicornia.

Dorcus parallelopipedus, *L.* In an old decayed Elm Tree, Q. Coll., W. Dallimore. In the larval state this insect usually feeds in decayed ash trees.

Aphodius fimitarius, *L.* In Propagating Pits. Coll., H. Ruck.

Aphodius punctato-sulcatus, *Sturm.* Herbaceous ground. Coll., W. Irving.

Two very common species of "dung beetles."

Serricornia.

Melanotus rufipes, *Hbst.* In Fern Houses. Coll., J. S. Christie.

Athous hoemorrhoidalis, *F.* In Aroid House. Coll., H. Green. In Propagating Pits. Coll., H. Ruck.

A common British "skip-jack" beetle.

Agriotes lineatus, *L.* In Propagating Pits. Coll., H. Ruck.

Dolopius marginatus, *L.* In Propagating Pits. Coll., J. Scott.

The above four beetles are common British species, but owing probably to the temperature of the houses at Kew, have appeared in imaginal form long before their normal period of emergence.

Telephorus rusticus, *Fall.* In Palm House. Coll. J. W. Anderson. A common species on Umbelliferae.

Heteromera.

Nacerdes melanura, *L.* Herbaceous ground. Coll., W. Irving. Breeds in old damp woodwork; often found in cellars and the streets of towns.

Rhyncophora.

Sitones sulcifrons, *Thumb.* In Herbaceous ground. Coll., W. Irving.

Coeliodes erythroleucus, *Gmel.* In Propagating Pits. Coll, H. Ruck.

Both species occur on *Ulex* in early spring, the former commonly, the latter very occasionally.

Cucujiidae.

Cathartus advena, *Wal.*, with seeds from Lagos. Coll., H. Green. A species, like *Silvanus surinamensis*, *&c.*, of widely extended distribution, associated with rice and various seeds—included in the "British List," but not necessarily or even probably a member of the British fauna in its strictly natural sense.

Carabidae.

Amara trivialis, *Gyll.* In Trop. Fern House. Coll., E. W. Morse. A common British ground beetle.

(*Exotic species.*)

Cryphaloides donisthorpei, *Formanck.* This interesting species to which reference has already been made (see *K. B.*, 1908, p. 121) has been described as new to science by Formanck, who has named it in honour of its captor Mr. H. St. J. Donisthorpe, of Kensington. It is a small cylindrical insect which bores tunnels and galleries in and under the bark of some kind of tree. The genus *Cryphaloides* is closely allied to *Cryphalus*, Er., of which we have British species which feed in beech, lime, and larch, and might, if they were less rare than they are, do considerable damage to such trees.

Baris (Acythopus) aterrimus, *Wat.* = *ochivora*, Blackburn. Found in a plant of *Dendrobium secundum* from Malaya. In Orchid Houses. Coll., A. C. Miles.

This beetle was undoubtedly imported with the orchid, since it is a native of the Malay States. It has occasionally been taken elsewhere in England, associated with imported Dendrobia.

Formicomus pedestris, *Rossi.* A specimen was found associated with ants (*Cremastogaster*) in cork in the Fern Houses. Coll., J. S. Christie. In Europe it inhabits Italy.

A heteromerous beetle which comes near our *Anthicus*. This beetle is figured (fig. 3) in the plate, and some notes are added on this interesting species by Mr. Donisthorpe (*see* p. 251).

Bruchus natalensis (?). Imported in seeds of *Parkinsonia* from S.W. Africa.

Bruchus sp. ? Imported in seeds of *Convolvulus nigerianus* from N. Nigeria.

Bruchus sp. ? Imported in leguminous seeds from South Africa.

The three specimens of *Bruchus*, two of which, at least, appear to be undescribed, were collected by J. Scott in seeds imported from Africa.

Examples of the second species are to be found in the British Museum from Angola and other places in W. Africa.

Bruchus sp. ?

Mechistocerus sp. ?

Cryphalus sp. ?

Imported from Lagos. Coll., H. Green, in seeds.

The *Mechistocerus* was found in leguminous seeds, and appears to be new to the British Museum collection, and has probably not yet been described.

THYSANOPTERA.

Richard S. Bagnall.

Until recently only three species of thrips were recorded from European hothouses, namely, *Heliothrips haemorrhoidalis*, Bouché; *H. femoralis*, Reuter, and *Parthenothrips dracaenae*, Heeger. In 1904, however, Prof. Reuter described *Leucothrips nigripennis*, from hothouses, Helsingfors, Finland, found on species of *Pteris*; and in 1907 Mr. Dudley Moulton described *Euthrips orchidii*, from four specimens found on orchids in a hothouse, California, U.S.A. The writer has taken both *Leucothrips nigripennis*, Reuter, and *Euthrips orchidii*, Moulton, in the houses of the Botanical Gardens, Brussels, and from greenhouses in the North of England, and this year described *Euthrips longipennis* and *Cephalothrips spinosus* from Brussels, and *Anaphothrips orchidaceus* from England, Ireland, Scotland, and Belgium. *Euthrips longipennis*, Bagnall, has occurred plentifully in the Palm House of the Leazes Park, Newcastle.

It is very probable that *Leucothrips nigripennis*, Reuter; *Euthrips orchidii*, Moulton, and *E. longipennis*, Bagnall, will ultimately occur in the Kew houses; they are all small species (about $\frac{3}{4}$ mm. in length) and might be easily overlooked. *Cephalothrips spinosus*, Bagnall, can scarcely yet be regarded as a true hothouse species, being described from a single specimen found on the leaf of *Strelitzia Nicolai*.

We are only able to put on record five specimens of *Thysanoptera* from the conservatories and propagating pits of the Royal Botanic Gardens, Kew, four of which have been collected by the late Mr. George Nicholson; and none from the Gardens proper, though it is practically certain that the wild thrips-fauna will be a comparatively large one.

It should be said that the houses are peculiarly free from these little pests. The writer on two occasions spent the whole day

collecting in the propagating pits as well as the larger houses; on the first occasion a single specimen of *Heliothrips haemorrhoidalis*, Bouché, was seen, and on the second, when special search was made for the species heretofore mentioned, only a few specimens of *Anaphothrips orchidaceus*, Bagnall, and *Thrips tabaci*, Lindeman, were captured. It is probable that the various ants which swarm in most of the houses help to keep down the thrips; the writer has found many species of hothouse thrips freely in several well-regulated and attended houses where ants are absent or scarce, but has always found thrips to be very scarce in houses infested by ants.

THYSANOPTERA.

TEREBRANTIA.

THRIPIDAE.

Anaphothrips orchidaceus, *Bagnall : Ent. Mon. Mag.*, 2nd ser., xx., p. 33, and *Ann. de la Soc. Entomologique de Belgique*, liii., p. 171, 1909.

Collected by the late Mr. G. Nicholson from *Zygopetalum*, and by the writer from *Epidendrum* and *Cymbidium* (Feb. 2nd, 1909). It also occurs on *Cypripedium* and *Odontoglossum*.

Heliothrips haemorrhoidalis, *Bouché*, and **H. haemorrhoidalis** var. **abdominalis**, *Reuter*.

On various hothouse plants.

H. femoralis, *Reuter*.

Collected by the late Mr. G. Nicholson from *Lissochilus* sp., *Lardizabala biternata*, *Agonis flexuosa*, and *Hiblertia dentata*, and by the writer from *Pteris* sp.

Parthenothrips dracaenae, *Heeger*.

Collected by the late Mr. G. Nicholson from *Dracaena* sp.

Thrips tabaci, *Lindeman* (*T. communis*, Uzel).

Larvae and perfect insect on *Iresine* spp. in one of the propagating houses, Feb. 2nd, 1909.

PISCES.

Cyprinus carpio, "The Carp."

A splendid specimen of this species was taken from the pond in June, 1906, and presented to the Natural History Museum, South Kensington, for preservation. It weighed between twelve and thirteen pounds, and was, considering the time of the year, in exceptionally fine condition. The scales were large and on the sides had the pronounced golden bronze tint.

The carp, which has the teeth in the throat, is principally a vegetarian, and, where food is plentiful, attains at times large dimensions. One caught at Harting great pond, near Petersfield, in 1858, weighed 24½ pounds. It is not indigenous to Britain, being a native of Chinese waters, but has become thoroughly naturalized over the greater part of Europe. It was introduced into England in the fifteenth century, and soon became an important article of food, its propagation being fostered by the religious communities then existing. Its introduction to American waters has been attended

by unforeseen consequences. In the Southern States it has spread with marvellous rapidity and in such numbers as to be a menace to the rice crops. The fish burrow and wallow in the soft mud of the rice fields, destroy the roots, and eat the fresh young shoots. Government action has had to be taken to reduce the numbers of the fish, but up to the present the efforts have not been attended with any great success.

Leuciscus cephalus, "The Chub."

A fish of about a pound in weight was seen by the writer rising at the flies in the Ha-ha on August 4th, 1906. This is interesting owing to the fact that the chub is becoming decidedly scarce—indeed it has almost disappeared from the Thames—below Teddington. Anglers wishing to make anything of a catch of chub in the Thames have to go above Sunbury to attain their object. Many years ago it was plentiful even around Old London Bridge, but being a lover of pure water it has gradually been driven to the upper reaches of the river. This love of pure water is not characteristic of many other cyprinoid fish, the carp, for instance, seeming to thrive best in water which is thick and muddy.

Like the carp the chub has pharyngeal teeth, but is not a strict vegetarian. It will rise freely to big bushy flies, and at times will not disdain a lively minnow. Also it is particularly partial to large soft cherries.

It is widely distributed throughout temperate Europe and Asia Minor, and in America is represented by the chub "suckers." The largest fish in England are caught in the Hampshire Avon and Dorchester Stour, Christchurch being a favored locality where fish of over seven pounds weight have been captured. It makes but insipid food, Isaac Walton being probably the only man who ever said anything in its favour, and his may only have been an acquired taste.

XXXIII.—DECADES KEWENSES

Plantarum Novarum in Herbario Horti Regii Conservatarum.

DECADES LII-LIII.

511. **Berberis approximata,** *Sprague* [Berberidaceae]; affinis *B. dictyophyllae*, Franch., a qua foliis plerumque denticulatis, floribus multo minoribus, glandulis petalorum approximatis recedit.

Rami juventute pruinosi. *Folia* obovata, 0·5–2 cm. longa, 2–10 mm. lata, mucronulata vel obtusa, denticulata vel integra, supra viridia, subtus pruinosa. *Spinae* graciles, usque ad 1·5 cm. longae. *Flores* solitarii vel bini, pedicellis 4–5 mm. longis. *Sepala* exteriora elliptica, 3·5–4 mm. longa, 2·5–3 mm. lata, interiora late elliptico-obovata, 5–6 mm. longa, 3·5–4·5 mm. lata. *Petala* obovata, circiter 5 mm. longa, 3–3·5 mm. lata, breviter bifida, glandulis oblique ovatis approximatis vel contiguis 1–1·5 mm. longis, 0·5–0·75 mm. latis. *Stamina* 3·5 mm. longa. *Pistillum* 3–3·5 mm. longum, ovario 2–2·5 mm., stylo 0·5–0·75 mm. longo; ovula 5–6.

Bacca rubra, pruinosa, obovoidea vel subglobosa, 6–7 mm. longa, 5–6 mm. crassa, stylo obvio, stigmate usque ad 1·5 mm. diametro.—*Berberis dictyophylla*, Hook. f. Bot. Mag. t. 7833, quoad stirpem cultam, non Franch.

China. Introduced by Vilmorin, Andrieux & Co., and described from specimens cultivated at Kew.

The genus *Berberis* has recently been revised by Schneider (Bull. Herb. Boiss., ser. 2, vol. v. p. 33), who has taken a more restricted view of the species than previous authorities have done. If Schneider's conceptions be adopted, then *B. approximata* must be treated as specifically distinct from *B. dictyophylla*. Taking a broader view, however, it might be regarded as a well-marked variety of the latter.

512. **Brownlowia Havilandii**, *Stapf* [Tiliaceae]; affinis *B. Denysianae*, Pierre, sed indumento insigniter lepidoto, inflorescentia laxa, floribus paulo minoribus, staminodiis subulatis distincta.

Arbuscula, 6 m. alta, ramulis junioribus dense lepidotis, demum glabratis cortice griseo-brunneo tectis. *Folia* lamina peltata, cuspidato-acuminata, ambitu ovato-rotundata, integerrima, 30 cm. longa, 20–25 cm. lata, firme chartacea, supra glabra, subtus minute et dissite albido-lepidota, nervis primariis circiter 9 quorum 4 inferiores perbreves, secundariis (e costa ortis) utrinque 3–4, omnibus subtus prominentibus, venis transversis laxis uti reticulatione gracili prominulis; petiolus ad 18 cm. longus, apice calloso-incrassatus, 5 cm. supra basin laminae insertus. *Panicula* terminalis, ultra 30 cm. longa, 15 cm. lata, perlaxa, undique lepidota; pedunculus brevis bracteis 4–5 sterilibus oblongis ad 2 cm. longis concavis munitus; rami distantes ascendentes vel suberecti, robusti, bracteis caducis; pedicelli robusti, 5–6 mm. longi, basi disarticulati. *Calyx* dense lepidotus subcampanulatus, 1·2 cm. longus, ad medium partitus, lobis triangulari-ovatis acutis. *Petala* alba, oblonga vel elliptica, 1·5–2·0 cm. longa, circa 7 mm. lata. *Gonophorum* subcylindricum, 2 mm. longum. *Filamenta* ad 1 cm. longa. *Staminodia* subulata, 6 mm. longa. *Carpella* 5, lepidota; stylus stamina paulo superans, apice tantum divisus.

Borneo. Sarawak, near Kuching, *Haviland*, 893.

513. **Triumfetta ramosa**, *Sprague et Hutchinson* [Tiliaceae]; affinis *T. actinocarpae*, S. Moore, a qua foliis majoribus, capsula triloculari, setis hispidis pilis pluribus terminatis differt.

Fruticulus circiter 23 cm. altus, virgate ramosus; ramuli congesti, stricte ascendentes, leviter flexuosi, 1–2 cm. diametro, superne tomentelli, inferne furfuraceo-puberuli. *Folia* elliptico-ovata, basi leviter cordata, apice obtusa vel rotundata, 1–2·5 cm. longa, 1–2 cm. lata, crenulato-serrulata, basi 7-nervia, utrinque (subtus densius) tomentella; petioli 3–8 mm. longi. *Cymae* in nodis solitariae, triflorae. *Gonophorum* 0·75 mm. longum; glandulae subquadratae, 0·5 mm. longae, 0·6 mm. latae. *Discus* membranaceus, ciliatus, in toto circiter 0·5 mm. altus. *Capsula* setis inclusis vix ultra 2 cm. diametro, trilocularis, loculis 1–2-spermis septo tenui falso divisis, corpore pubescente 8 mm. diametro, setis 5–7 mm. longis hispidis, pilis lateralibus 1–2 mm. longis, pilis terminalibus pluribus 0·25–0·3 mm. longis. *Semina* 3 mm. longa.

N.W. Australia. Nicol Bay and De Grey River, *Ridley's Expedition*.

514. **Triumfetta triandra**, *Sprague et Hutchinson* [Tiliaceae]; affinis *T. plumigerae*, F. Muell., a qua alabastris gracilioribus, floribus triandris, petalis pro rata angustioribus, ovariis et capsulis ovoideis, setis brevius pilosis, necnon indumento foliorum subtiliore recedit.

Folia oblonga, utrinque angustata, 2–5 cm. longa, 0·7–1·3 cm. lata, crenulato-dentata, indumento subtili subgriseo asperulo. *Sepala* 5–5·5 mm. longa cornu excluso, 0·6 mm. lata; cornu 0·7 mm. longum, 0·25 mm. infra apicem insertum. *Petala* spathulato-oblanceolata, apice rotundata, 3 mm. longa, 0·8 mm. lata, inferne 1·2 mm. pubescentia et ciliata, ungue inferne valde incurvo. *Gonophorum* constrictum, 0·25 mm. longum; glandulae ellipticae. *Discus* membranaceus, 0·3 mm. longus, ciliatus. *Stamina* 3, 3–5 mm. longa. *Ovarium* ovoideum, triloculare, 1 mm. longum. *Capsulae* juniores ovoideae, setis inclusis 5–6 mm. longae; setae 1·5–2 mm. longae, breviter pilosae, pilis pluribus terminatae.—*T. plumigera*, Benth., Fl. Austr., vol. i., p. 274, partim, non F. Muell.

N.W. Australia. Montague Sound, *Cunningham*, 236; without precise locality, *Bynoe*.

515. **Triumfetta plumigera**, *F. Muell.* [Tiliaceae]; descriptio amplificata (auctore T. A. Sprague).

Folia indumento grosso subfulvo aspero. *Sepala* 5 mm. longa cornu excluso, 0·7–0·8 mm. lata; cornu 1 mm. longum, 0·3 mm. infra apicem insertum. *Petala* oblanceolata, 4 mm. longa, 1·4 mm. lata, inferne 0·75 mm. intus pubescentia et ciliata. *Stamina* 10. *Ovarium* globosum, triloculare. *Capsulae* globosae, setis 6–8 mm. longis longe pilosis pilis pluribus terminatis.

N. Australia. Depot Creek, sources of the Victoria River, *Mueller*. Queensland. Endeavour River, *Cunningham*.

Neither Mueller nor Bentham gives the number of the stamens, which is an important character in *Triumfetta*. Bentham, in *Fl. Austr.*, vol. i., p. 274, states that the ovary is 2-celled.

7155 516. **Rubus Veitchii**, *Rolfe* [Rosaceae-Rubeae]; a *R. flosculoso*, Focke, foliolis grosse dentatis et floribus paucis et majoribus differt.

Frutex, ramuli aciculati, pruinosi, teretes. *Folia* alterna, pinnata, 6–15 cm. longa; foliola 5–9, lateralia elliptica vel oblique ovata, grosse dentata, 1–3 cm. longa, terminalia ovato-lanceolata vel rhombea, 4–8 cm. longa, grosse dentata vel subpinnatifida; supra viridia, puberula vel sericea, subtus incana; rachis aciculata et pubescens; stipulae lineari-lanceolatae, acuminatae, circa 5 mm. longae. *Flores* in paniculas terminales pauciflloras dispositi; pedicelli dense pubescentes. *Calyx* dense pubescens, lobis triangularibus acuminatis patentibus. *Petala* orbiculari-obovata, 3 mm. longa, purpurea. *Stamina* erecta, 3 mm. longa, purpurea. *Carpella* sericea; styli glabri, 2 mm. longi, carnei. *Fructus* globosus, 1·5 cm. latus, drupis numerosis parvis globosis glabris rubris.

Western China. Valleys up to 7000 ft., *Wilson*, 3483.

Flowered with Messrs. James Veitch & Sons, in August, 1908, the plants having been grown from seeds sent by Mr. E. H. Wilson. It must also be allied to *R. Giraldianus*, Focke, a species which is not represented at Kew.

517. **Rubus omeiensis**, *Rolfe* [Rosaceae-Rubeae]; a *R. pinnatisepalo*, Hemsl., caule et petiolis haud aciculatis et floribus paniculatis differt.

Frutex, ramuli inermes, velutini, subflexuosi. *Folia* alterna, simplicia, petiolata, breviter 5-lobata vel interdum obscure 7-lobata, lobis sinuatis vel sublobatis, irregulariter dentatis, supra glabra minutissime puberula et pulchre rugosa, infra infinite reticulato-venosa et incana, 8–15 et interdum 23 cm. longa et lata; petiolus 4–8 cm. longus, velutinus; stipulae oblongae, profunde laciniatae, 1–2 cm. longae. *Flores* in paniculas terminales dispositi, numerosi, interdum subcongesti; pedicelli dense pubescentes. *Calyx* dense pubescens, lobis triangularibus acutis reflexis. *Petala* erecta, obovato-elliptica, 4 mm. longa, purpurea. *Stamina* numerosa, erecta, 4 mm. longa, filamentis albis. *Carpella* glabra; styli 4 mm. longi, albi. *Fructus* ignotus.

Western China. Mt. Omei, *Wilson*, 4851.

Mr. E. H. Wilson also sent seeds of this shrub to Messrs. James Veitch & Sons, who, in August, 1908, communicated flowering specimens to Kew. It may also be nearly allied to *R. Cavaleriei*, Lév. et Van., although not identical with it, as the sepals cannot be described as much longer than the rest of the flower, nor could the authors have overlooked the remarkable stipules of this plant.

518. **Hydrocotyle Versteegii**, *Hemsl.* [Umbelliferae-Hydrocotyleae]; species ex affinitate *H. javanicae*, Thunb., a qua differt foliis ambitu reniformibus et umbellis subsolitariis breviter pedunculatis.

Herba late repens, parce puberula, caulibus elongatis gracillimis debilibus ad nodos saepe radicantibus. *Internodia* nonnumquam usque ad 15–20 cm. longa. *Folia* graciliter petiolata, erecta; lamina membranacea, reniformis, 1–5 cm. lata, 5–7-lobulata, lobulis rotundatis crenato-dentatis; petiolus filiformis, erectus, 1–10 cm. longus. *Umbellae* dense capitatae, ad nodos solitariae vel interdum binae, altera subsessilis, altera distincte sed breviter pedunculata, multiflorae, floribus brevissime pedicellatis. *Flores* non visi. *Fructus* glaber, latior quam longus, 1·5–2 mm. latus; carpella valde compressa; in latere indistincte 1-costata, stylis persistentibus patentibus vel recurvis.

Dutch New Guinea. Alkmaar, *G. Versteeg*, 1497.

I have not been able to match this plant with any specimens at Kew, and in describing it I have only taken *H. javanica*, Thunb., into account as described and figured by the author, not as understood by some later writers.

519. **Mackinlaya confusa**, *Hemsl.* [Araliaceae-Mackinlayeae]; species *M. amplifoliae*, Hemsl., proxima sed fere omnibus partibus minor, et ab ea foliolis saepius distincte paucilobatis et inflorescentia folia excedente differt.

Herba ampla (*Macgillivray*), undique glabra, ramis floriferis graciliusculis. *Folia* digitatim 5-foliolata, suprema pedatipartita, circiter 12 cm. diametro, breviter petiolata; foliola valde inaequalia,

2 inferiora intermediis adnata, sessilia, anguste lanceolata, 5-10 cm. longa, integra, obtusa, caetera distincte petiolulata, cum petiolulo circiter 15 cm. longa, petiolis 3–4 cm. longis, supra medium trilobata, lobis lateralibus multo brevioribus; folia inferiora cum petiolo perfecto non visa, sed foliola majora, fere elliptica, utrinque 3–8 lobulata. *Inflorescentia* terminalis, stipitata, stipite 15–20 cm. longo, umbellata, decomposita, 15–20 cm. diametro; radii primarii 15–20, graciles, 5–10 cm. longi; umbellulae ultimae 3–6-florae; pedicellis fere capillaribus inaequilongis; bracteae lineari-lanceolatae, 1–15 cm. longae, acuminatissimae; bracteolae similes sed minores. *Flores* (masculi tantum visi) minimi, iis *M. amplifoliae* simillimi.

M. macrosciadea, Benth. Fl. Austral. vol. iii. p. 383, quoad plantam ex insula Dunk, non F. Muell.

Queensland. Dunk Island, Rockingham Bay, June 5th, 1848, *John Macgillivray*, 269.

Macgillivray's 269 *β*, from Fitzroy Island, a degree farther north, is *M. macrosciadea*, F. Muell. Both species occur in the Rockingham Bay district.

There is some uncertainty about the size, habit and duration of the plants included here under the genus *Mackinlaya*. Mueller gives no dimensions in his original description of *Panax macrosciadea*, nor in his definition of the genus *Mackinlaya*, but in his "Essay on the Plants of the Burdekin Expedition," he mentions it as a tree 20 to 30 feet high. Bailey, *Queensland Flora*, part 2, p. 730, describes it as a slender shrub or small tree, and Hill's label records it as a slender shrub. In Macgillivray's manuscript list at Kew of his botanical collections his n. 269 (*M. confusa*, Hemsl.) is defined as a "large herb. plant with 5-digitate leaves." Versteeg notes *M. amplifolia*, Hemsl., as a tree 3 metres high. It is probable that the stem or trunk, as in so many other relatively small members of the *Araliaceae*, is unbranched at the base.

520. **Mackinlaya amplifolia**, *Hemsl.* [Araliaceae-Mackinlayeae]; species robusta a *M. macrosciadea*, F. Muell., foliorum amplitudine ac divisione, inflorescentia umbellata ad gradum quintum divisa, radiis primariis circiter 10 tantum et umbellulis ultimis paucifloris recedit.

Arbor 3-metralis (*Versteeg*) omnino glabra, ramis floriferis crassis. *Folia* composita, digitatim vel pedatim secta, simul nonnunquam pseudopinnata, ampla, cum petiolo communi usque ad 60 cm. longa (inferiora forsan longiora); foliola 5 vel 7, inaequalia, ovato-lanceolata, cum petiolulo 15–35 cm. longa, acuminata, acuta, basi cuneata vel late rotundata, integra vel obscure lobulata et remote denticulata, lateralia plus minusve obliqua, 2 infima multo minora, breviter petiolulata, intermedia, ut terminale, longe petiolulata, terminale indivisum vel pinnatim tripartitum segmentis lateralibus obliquis segmento terminali longe petiolulato; petiolus communis validus, usque ad 30 cm. longus, teres, striatus, basi anguste vaginans, caulem vel ramum amplectens. *Inflorescentia* terminalis, longe stipitata, umbellata, decomposita, circiter 30 cm. diametro, foliis brevior; radii primarii circiter 10, 12–18 cm. longi; umbellulae ultimae 3–6-florae, pedicellis brevissimis inaequilongis; bracteae et bracteolae lineari-lanceolatae, sursum gradatim minores,

inferiores 1–1·5 cm. longae. *Flores* (masculi tantum visi) 1·5–2 mm. diametro; calycis dentes lanceolati, acuti, quam petala inflexa longiores.

Dutch New Guinea. Geiten Noord, *G. Versteeg*, 1442.

F. Mueller founded the genus *Mackinlaya* (*Fragm. Phytogr. Austral.*, vol. iv., p. 119, t. 29) on specimens of a plant collected at Port Molle and Rockingham Bay; but he had previously described (op. cit., vol. ii., pp. 108, 176) this plant under the name of *Panax macrosciadeus*, from specimens collected by E. Fitzalan, "ad Portum Mòlle insularum Cumberland Islands," Queensland, Australia. Subsequently Bentham (*Flora Australiensis*, vol. iii., p. 383) added some additional localities, including Fitzroy Island and Dunk Island, from the collections of J. MacGillivray. The specimen in question from Fitzroy Island is the genuine *Mackinlaya macrosciadea*, F. Muell., and it has since been collected in the same island by W. Hill; but the Dunk Island plant is quite different, though I think it may be referred to the same genus, at least until female flowers and fruit are known, both being wanting at present.

A third species, closely related to the Dunk Island plant, has been collected by Mr. G. Versteeg, in Dutch New Guinea. Both species differ from *M. macrosciadea* in having a larger, decompound, male inflorescence and of both only young male flowers are known. Male and female flowers and ripe fruit of *M. macrosciadea* are amply represented at Kew. The umbels are branched to the second place only, and the baccate fruit is didymous.

So far as the material goes the previously undescribed species differ from the original species in no essential character, unless the decompound umbels be considered as such. All three species have petals with strongly inflexed tips, which are exceptional in the *Araliaceae*, but they are valvate in aestivation, as in *Araliaceae* generally:

521. **Vernonia Dalzelliana**, *Drummond et Hutchinson* [Compositae-Vernonieae]; affinis *V. salignae*, DC., et *V. extensae*, DC.. a priore capitulis paucioribus multo majoribus et achaeniis pilosis facile distinguitur, a *V. extensa* phyllariis conspicue angustioribus et acuminatis nec obtusissimis, achaeniis etiam manifestius pilosis nec glandulosis recedit.

Suffrutex gracilis, erectus vel subscandens, circiter 1 m. altus, ramis anfractuosis angulatis argute et crebre sulcatis puberulis vel denique glabratis. *Folia* oblanceolata vel oblongo-lanceolata, ad medium caulem, ubi maxima, 12–20 cm. longa, 3–6 cm. lata, sensim acuminata, obscure mucronata, plus minus irregulariter repando-serrata, serris acutis vix magis quam 7 mm. distantibus, utrinque pilis minutis albidis plus minus adspersa, nervis lateralibus 7–11 supra plus minus infra prominentibus pallidis, secundariis laxe reticulatis manifeste anfractuosis ad margines per serras in mucronem minutum excurrentibus, omnibus pilis furcatulis frequentius ornatis, pagina inferiore (in planta sicca) pallide virescente. *Ramuli florescentes* villis fuscescentibus caducis sparsius vestiti vel omnino glabrati. *Capitula* 3–10, subcorymbosa, subcampanulata. *Phyllaria* circiter 7-seriata, ab extra conspicue magnitudine increscentia, extrema valde minuta, omnia lanceolata, acuta, dorso carinata, margine

utroque subscarioso, superne pubescentia apice plus minus colorata, post anthesim stellate patentia. *Corollae tubus* tenuissimus, 1 cm. longus; lobi argutissimi, circiter 5 mm. longi. *Achaenia* subteretia, pluri-sulcatula, 3 mm. longa, pilis argenteis ascendentibus munita, versus apicem quasi in patellam incrassata, basi pulvinulo areolato, eburneo suffulta, pappo circiter 7 mm. longo minutissime barbulato albescente coronata.

Southern India. Gondebyle Ghat, *Dalzell*, in Herb. Hort. Calc.; Gairsoppa Falls, North Canara, *Talbot*, 1401; Coorg, *Cameron*; Maruhalli, Mysore, *Meebold*, 8473.

This appears to be *Decaneurum lilacinum*, Dalzell & Gibson, Bombay Fl. p. 314 (1861), of which, as stated in Fl. Brit. Ind. iii. p. 241, there is no specimen, under that name at least; we have had before us, however, a specimen of Dalzell's, now in the Calcutta Herb. (from Gondebyle Ghat, as above), collected evidently in the same region as "Decaneurum lilacinum" *i.e.*, on the Ghats South of Bombay) which Mr. Hemsley has already pointed out in a note on a specimen from T. Thomson's Herbarium, supposed to have been collected in Coorg, to be our plant, which is named in ms. "Decaneurum glabrum." Dalzell & Gibson's specific name is preoccupied, under *Vernonia*, by *V. lilacina*, Martius ex DC. Prodr. v. 48, from Brazil. We have not been able to see *Decaneurum glabrum*, DC., but from the description it is not our plant.

522. **Ceropegia discreta**, *N. E. Brown* [Asclepiadaceae]; affinis *C. longifoliae*, Wall., sed glabra, corollae lobis multo minoribus et forma diversis differt.

Herba tuberosa, caule volubili gracili glabro. *Folia* coriacea vel subcarnosa, petiolata; petiolus 7–10 mm. longus; lamina 6–10 cm. longa, 6–8 mm. lata, lineari-lanceolata, acuminata, glabra, minute adpresse ciliata. *Umbellae* laterales, pedunculatae, 2–8-florae. *Pedunculi* 1·8–3·5 cm. longi, graciles, glabri. *Bracteae* 1–3 mm. longae, subulatae. *Pedicelli* 6·8 mm. longi, graciles, glabri. *Sepala* 3·5–4 mm. longa, subulata, glabra. *Corolla* 3 cm. longa, curvata; tubus 2·3 cm. longus, basi inflatus, elliptico-oblongus, albidus, fusco-venosus, superne cylindricus, purpureus, extra glaber, intra basi excepta pilosus; lobi conniventes, apice connati, 6 mm. longi, basi 3 mm. lati, ovato-lanceolati, replicati, intra carinati, basi pallide lutei, apice purpureo-virides et intra pubescentes, carina longe ciliata. *Corona exterior* dentibus 5 deltoideis obtusis erectis coronae interioris lobis oppositis cum sacculis 5 minutis alternantibus. *Coronae interioris lobi* 2 mm. longi, anguste spathulato-lineares, basi conniventes, deinde leviter divergentes, apice incurvati et connati, lutei, glabri.

India. Collected in Coimbatore by the Conservator of Forests of Coimbatore, and sent, in 1907, from the Royal Botanic Garden, Calcutta, to Kew, where it flowered in October, 1908.

523. **Rehmannia Henryi**, *N. E. Brown* [Scrophulariaceae]; affinis *R. angulatae*, Hemsl. sed humilior, foliis obtuse lobatis et dentatis, bracteis longe petiolatis, calycis lobis latioribus et corolla alba differt.

Herba perennis 15–40 cm. alta, simplex vel basi ramosa, ubique glanduloso-pilosa. *Folia* radicalia 7–18 cm. longa, 2·5–6 cm. lata,

elliptico-oblonga, obtusissima, basi in petiolum 1–6 cm. longum attenuata, crenato-dentata vel plus minusve pinnatim lobata et obtuse dentata; folia caulina vel bracteae simillima, gradatim minora, longe petiolata. *Flores* axillares, 3–6 cm. distantes. *Pedicelli* adscendentes, 3–5 cm. longi, basi bracteolis 1–2 subulatis 2–4 mm. longis muniti. *Calyx* adscendens (haud nutans) campanulatus, lobis patentibus; tubus 1–1·3 cm. longus; lobi subaequales 1–1·2 cm. longi, 5–9 mm. lati, anguste vel late deltoidei, obtusi, glandula brunneo-aurantiaca subapiculati, integri vel pauce dentati. *Corollae* tubus 4·5–5 cm. longus, dorsaliter compressus, apice 2 cm. latus, extra pubescens, sordide sulfureus, minute rubro punctatus, intra inferne glaber, superne pubescens, luteus, minute rubro-punctatus; limbus obliquus, bilabiatus, 4·5 cm. diam., albus, utrinque pubescens; labium superius bilobum, lobis subquadratis apice obtusissime rotundatis emarginatis; labium inferius fere ad basin trilobum, lobis 2·5 cm. longis 1–5 cm. latis oblongis apice rotundatis, medio lateralibus imbricato, palato bicarinato dorso faucis adpresso. *Stamina* inclusa, glabra, antherarum loculis 3 mm. longis deflexo-divergentibus. *Ovarium* ovoideum, glabrum; stylus inclusus, glaber; stigmata late rotundata.

China. Nanto and mountains to the northward, *Henry*, 3839; Ichang, *Henry* 1157, 1376; without precise locality, *Wilson*.

Described from living plants raised from seeds collected by Mr. Wilson in China, and contributed to Kew by the Director of the Arnold Arboretum.

524. **Incarvillea grandiflora**, *Bur. et Franch.* var. **brevipes**, *Sprague* [Bignoniaceae-Tecomeae]; a typo pedunculo quam pedicellis multo longiore recedit.

Herba 15–40 cm. alta, minute papilloso-puberula mesophyllo foliorum excepto. *Folia* 2–5, in toto 5–30 cm. longa, pinnatipartita vel segmento terminali tantum evoluto; segmenta crenato-serrata, terminale suborbiculare, 3–12 cm. diametro, basi rotundatum vel subcordatum, apice rotundatum vel obtusissimum, lateralia utrinque rhacheos 3–4 (1–5), ovato-oblonga, 1·5–6 cm. longa, 1–3·5 cm. lata, basi rotundata vel cordata, apice obtusa vel subacuta; petiolus 2–17 cm. longus. *Pedunculus* solitarius, 5–25 cm. longus, 2–4 (1–5)-florus; bracteae 1–2 cm. longae; pedicelli 1–2·5 cm. longi; flores aperti 1–2. *Calycis tubus* 1·4–2 cm. longus, quinque-alatus, extus inferne interdum nigro-punctatus; lobi ovato-deltoidei, acuminati, 5–6 mm. longi. *Corollae tubus* 4–6 cm. longus, intus luteus, vittis duabus albis in basin cujusque lobi incurrentibus; limbus roseus vel roseo-purpureus, 5–7·5 cm. diametro.

China. N. W. Yunnan: on barren, dry, stony ground on plain at the north end of the Lichiang valley, 2700 *m.*, *Forrest*, 2131; in open mountain meadows on the eastern flank of the Lichiang Range, 3300 m., *Forrest*, 2464.

A batch of *I. grandiflora* var. *brevipes* was exhibited in May 1909 at the Temple flower-show under the name "*I. Bowalotii*" by Bees, Ltd. The above description was drawn up partly from the living plants and partly from Forrest's dried specimens which were kindly lent for the purpose by Prof. I. Bayley Balfour, who

has also presented two photographs of plants grown in the Royal Botanic Garden, Edinburgh, and one of the species in its natural habitat.

525. **Phyllanthus chiapensis**, *Sprague* [Euphorbiaceae-Phyllantheae]; affinis *P. laxifloro*, Benth., a quo foliis minoribus obovato-oblongis rotundatis, inflorescentiis brevioribus differt.

Frutex 2 m. altus, ramulis 2–4 mm. diametro tetragonis glabris, angulis leviter alatis. *Folia* obovato-oblonga, apice rotundata, basi subcuneata, 3·5–5 cm. longa, 1·5–2·3 cm. lata, supra obscura, glabra, venis inconspicuis, venulis occultis, subtus pallidiora, in mesophyllo minutissime furfuraceo-lepidota, tandem cana venulis conspicuis; venae laterales utrinque 6–7; petioli 4 mm. longi; stipulae ligulares, 5 mm. longae, 1·75 mm. latae. *Paniculae* 3–6 cm. longae. *Flores* ♂ rubentes, fere ut in *P. laxifloro*, ♀ ignoti. *Stamina* 3. *Capsula* depresso-globosa, ultra 3 cm. diametro, nigro-brunnea. *Semina* angulato-ovoidea, circiter 1 cm. longa.—*P. laxiflorus*, Hemsl. Biol. Centr. Amer. Bot. iii. 104, partim, non Benth.

Mexico. State of Chiapas, on dry hills at Cacate, *Linden*, 1634.

A dried specimen and a capsule of *P. chiapensis* have been received from Mr. H. M. Hall, Department of Botany, University of California. These were from a bush cultivated at Santa Barbara, California.

P. chiapensis belongs to a little-known group of *Phyllanthus* which includes *glaucescens*, Kunth, *adenodiscus*, Muell. Arg., *laxiflorus*, Benth. (DC. Prod. vol. xv. pt. 2, p. 374), and *tequilensis*, Robins, & Greenm. (Proc. Amer. Acad. vol. xxix. 1894, p. 392). *P. tequilensis* differs from the other species in having only two stamens in the male flower. The large fruit appears to be characteristic of the group.

526. **Trigonostemon thyrsoideum**, *Stapf* [Euphorbiaceae-Crotoneae]; *T. philippinensi*, Stapf, consimile, sed inflorescentiae unisexuales, flores masculi sepalis petalisque 5-nis.

Arbuscula, ad 5 m. alta, inflorescentiis exceptis glabra, ramulis superne sulcatis. *Folia* lanceolata vel oblongi-lanceolata, basi acuta vel subobtusa, remote crenato-dentata, dentibus apice glandula (hydatodo) terminatis, 18–32 cm. longa, ad 8 cm. lata, papyracea, nervis secundariis utrinque 9–11 obliquis tenuibus; petioli circiter 5 cm. longi, subgraciles. *Inflorescentiae* terminales, e basi ramosae, thyrsoideae, masculae ad 18 cm. longae, ad 12 cm. latae, foemineae (una tantum visa) 15 cm. longae, 8 cm. latae, omnibus partibus fulvo-pubescentes, inferne glabrescentes; rami inferiores ad 7 (♀) vel 10 (♂) cm. longi, ad $\frac{1}{3}$ vel $\frac{2}{3}$ indivisi, caeteri breviter nudi vel e basi florigeri; thyrsi masculi iterum iterumque ramulosi, ramulis pedicellisque tenuibus brevibus vel ad 4 mm. longis, thyrsi foeminei ob cymas plerumque reductas fere racemos referentes pedicellis robustioribus sub anthesi ad 3 mm. longis; bracteae thyrsi masculi subulatae, ad 3 mm. longae, caducae, thyrsi foeminei lineares vel subulatae, eae axis primariae herbaceae, ad 15 mm. longae, ad 3 mm. latae. Flos ♂. *Sepala* 5, rotundato-elliptica, ad 1·5 mm. longa, dorso pubescentia, marginibus membranaceis erosulis. *Petala* 5, oblonga, obtusa, 3–3$\frac{1}{2}$ mm. longa, flava, glabra. *Disci* glandulae 5, obovato-

oblongae. *Stamina* 3, 1·5 mm. longa, antheris columnae brevi insidentibus, loculis approximatis vel magis minusve distantibus, connectivo ultra antheras producto alte bilobo. Flos ♀. *Sepala* 5, iis floris masculi similes, sed tota herbacea. *Petala*, 5, ut in flore masculo, 4 mm. longa. *Disci* glandulae 5 in annulum haud altum 5-lobum connatae. *Ovarium* 3-lobum ; stigmata brevia, divaricato-biloba.

China. Yunnan, Szemao, 1500 m. alt., *Henry*, 11947.

The panicles seen are strictly unisexual, but whether they came from the same tree or not is uncertain. The difference in the appearance of the male and female inflorescences is rather striking, and the branching of the male thyrsus goes very much farther than in any other species of *Trigonostemon*. The thecae of the anthers are sometimes contiguous, but more often distant by as much as their own width.

527. **Setaria surgens**, *Stapf* [Gramineae-Paniceae] ; affinis *S. glaucae*, Beauv., sed habitu gracili, culmis fasciculatis ramosis geniculato-ascendentibus, gluma superiore multo longiore, valva fertili minus transverse rugosa distincta.

Gramen, ut videtur, perennans, sed saepe primo anno florens. *Culmi* graciles, glaberrimi, fasciculati, iterum geniculati, ascendentes, 30–40 cm. alti, 5–6-nodi, inferne vel e medio 1–2-ramosi, internodiis quam vaginis brevioribus saepe lateraliter egressis vel longioribus, summo plerumque longissime exserto, geniculis nigricantibus. *Foliorum vaginae* primo arctae, inferiorum deinde plerumque ab internodiis retractae, glabrae, laeves ; ligulae ad lineam densissime breviter ciliatam redactae ; laminae lineares, longe tenuiter attenuatae, 8–15 cm. longae, 2–4 (rarius ad 5) mm. latae, glaucae, inferne hincinde pilis tenuissimis longiusculis conspersae, laeves. *Spicae* spuriae cylindricae, 2–5 cm. longae, rhachi pubescente, ramulis oppositis vel verticillatis, verticillis sua longitudine vel saepius longius distantibus, setis in quoque ramulo circiter 8 prorsus scaberulis 8–12 mm. longis. *Spiculae* ambitu obovato-ellipticae, 2·5–3 mm. longae, albo-virides, glabrae. *Gluma* inferior late-ovata, acuta, vel apiculata, circiter 1 mm. longa, nervis 3–5 prominulis ; gluma superior sub anthesi spiculam aequans, demum saepe quarta parte brevior late ovata, apiculata, 5-nervis, nervis prominulis. *Valva* inferior glumae superiori similis, spiculae longitudine cum palea elliptica paulo breviore vacua ; valva superior fertilis a latere visa oblique ovata, acuta vel apiculata, transverse rugulosa, 5-nervis. *Antherae* 1·5 mm. longa. *Caryopsis* ambitu suborbicularis, ultra 1·5 mm. longa.

Dutch New Guinea, S.E. Merauke, in alang alang savannas, 9 Nov. 1907, *G. Versteeg*, 1907.

This species is also represented at Kew from the following localities : North Australia, Port Essington, Armstrong, 551 ; Port Darwin, comm. R. Schomburgk, 32 ; Victoria River, F. Müller ; without precise locality, R. Brown ; Queensland, Port Curtis, MacGillivray, B. 68 ; "Sub-Tropical New Holland" (probably Queensland), Mitchell.

Schomburgk's and Müller's specimens are considerably stouter than the remainder, whilst those from New Guinea represent the other extreme. The latter are very thin and drawn out, and evidently not more than one season old.

528. **Pollinia leptantha**, *Stapf* [Gramineae-Andropogoneae]; affinis *P. argenteae*, Trin., sed racemis numerosis, spiculis minoribus, articulis gracilioribus, valva superiore (fertili) brevissime dentata, antheris in spicula sessili minoribus, in pedicellata hebetatis minutissimis.

Gramen perenne, culmis in rhizomate brevissimo fasciculatis, innovationibus paucis intravaginalibus. *Culmi* florentes circiter 1 m. alti, teretes, glaberrimi, simplices, 4–5-nodi, internodiis plerisque exsertis. *Foliorum vaginae* teretes, infimae breves, castaneae, diu persistentes, caeterae ultra 15 cm. longae, striatae, laevissimae, praeter margines superiores et junctionem cum lamina pilosam glabrae, ad nodos glauco-pruinosae; ligulae brevissimae, in cilia densissima solutae, a dorso pilis longioribus stipatae; laminae lineares, longissime setaceo-attenuatae, ad 45 cm. longae, 2–5 mm. latae, rigidulae, suberectae, livide virides vel purpurascentes, praeter basin intus saepe hirsutam glabrae, costa tenui albida, nervis lateralibus primariis utrinque 3–4 prominulis. *Racemi* ad 25 in rhachi communi ad 1·5 cm. longa e nodis circiter 3 brevissime ramosa conferti, graciles, flexuosi, ad 12 cm. longi, albo-pilosi; articuli graciles, superne paulo incrassati, 2 mm. longi, dense patule ciliati, pilis summis articulum fere aequantibus; pedicelli articulis aequilongi et simillimi, nisi tenuiores. *Spiculae* sessiles cum callo brevi barbato 2·5 vel vix 3 mm. longae, oblongo-lanceolatae, inferne spadiceae, superne pallidiores. *Gluma* inferior apice subintegro hyalina, caeterum chartacea, ad flexuras a basi ad $\frac{3}{4}$ dense patule albo-ciliata, in dorso depresso glabra vel inferne pilosa, nervis utrinque 2 tenuissimis, uno in flexura, altero propinquo extra sito; gluma superior subnavicularis, obtuse carinata, superne hyalina, 1- vel obscure 3-nervis, infra apicem versus margines breviter pilosula. *Valva* inferior linearis obtusiuscula, glumas aequans, hyalina, enervis, ad margines implicatas superne ciliata, vacua; valva superior quam inferior brevior, anguste lanceolata, apice minute bidentata vel tota aristae adnata, arista tenui ad 7 mm. longa, pallide spadicea, columna perbrevi, subula torta flexuosa scabrida. *Palea* oblonga, hyalina, 0·5 mm. longa. *Stamina* 3; filamenta 1·25–1·4 cm. longa; antherae 0·5–0·7 longae, lineares. *Styli* basi breviter connati; stigmata fere 1·5 mm. longa, stylis paulo longiora. *Caryopsis* oblonga, subcylindrica, brunnea, 1 mm. longa, stylorum basi communi coronata. *Spiculae* pedicellatae, sessilibus simillimae nisi interdum paulo minores et staminibus hebetatis, filamentis ovario brevioribus, antheris subdidymis 0·16–0·12 mm. longis sterilibus.

Dutch New Guinea, S.E. Merauke in alang alang savanna, 30 Oct. 1907, *G. Versteeg*, 1851.

529. **Oxytenanthera Alopecurus**, *Stapf* [Gramineae-Bambuseae]; affinis *O. brachythyrso*, K. Sch., sed foliorum laminis subtus tenuiter tessellatis, inflorescentiis gracilioribus, spicularum glomerulis numerosioribus, spiculis 20–24 mm. longis, antheris 6 mm. longis, apice brevius micronulatis.

Frutex scandens. *Culmi* glaucescentes, fistulosi, circiter 1 cm. supra nodos tumidiusculi, infra nodos puberuli, demum glabrati, ramis fasciculatis 3–6-nis 10–15 cm. longis 6–7-nodis, internodiis

inferioribus 2–3 abbreviatis cataphyllis deciduis, caeteris vaginis foliorum perfectorum amplexis supra nodos annulo flexorio tenui nigricante cinctis. *Cataphylla* culmorum ignota, ramorum coriacea, glabra, infima brevia, lata, summum ad 4 cm. longum, lamina nulla vel ad apiculum reducta ; pulvilli basales persistentes, fuscescentes, dense emergentiis claviculiformibus apice spinulam reversam gerentibus interdum lateraliter coalitis obsiti. *Folia* culmorum ignota praeter vestigia vaginarum in fibras culmo adpressas soluta, ramorum 4–5 approximata ; eorum vaginae arctae, prominenter striatae, versus margines superne inter costulas puberulae et minute reverse spinulosae, ad junctionem cum lamina in dorso in jugum productae ; ligulae in fimbrias ad 7 mm. longas rigidas solutae ; laminae magis minusve horizontaliter dispositae oblongo-lanceolatae, costa inaequaliter divisae, latere inferiore latiore, acute acuminatae, basi subaequaliter rotundatae et brevissime in petiolum pubescentem contractae, superiores ad 15 cm. longae et 3·5 cm. latae, inferiores breviores et angustiores, siccae pallide virides, supra medium ad margines scabridae, caeterum laeves, praeter imam basin pubescentem glabrae, costa tenui, nervis lateralibus primariis utrinque circiter 7, totidem secundariis interjectis, venis transversis crebris subtus prominulis saepe per 2–3 interstitia secundaria productis rectis vel flexuosis. *Rami* florentes plerumque solitarii inter vel potius supra ramos foliigeros emortuos orti, inferne ramosi, 20–25 cm. longi, longiores nutantes inferne basi cataphyllis squamiformibus persistentibus obtecti, e nodis caeteris bracteas ad vaginas reductas caducas pulvillos annulares reverse scaberulos desinentes emittantes. *Racemi* compositi, bracteati, inferiores elongati ad 6 cm. longi, sequentes multi abbreviati, contracti, ex ima basi ramosi cum ramulis abbreviatis glomerulos elongatos vel globosos formantes, summi simpliciores ad fasciculos spicularum reducti ; bracteae ovatae, apiculatae, 4–6 mm. longae, subcoriaceae, subpubescentes, inferiores circiter 4 spiculas foventes. *Spiculae* uniflorae anguste cylindricae, 20–25 mm. longae, in pedunculis brevissimis bracteas parvas squamiformes 2–4 gemmiparas gerentibus ; rhachilla 2 mm. ultra anthoecium producta, setiformis, scaberula. *Glumae* (vacuae) convolutae, inferior lata, mucronulata, 3–4 mm. longa, superior elongata mucronata, dimidium spiculae aequans, utraque striato-multi-nervosa. *Valva* involuta, angusta, spiculam aequans, mucronata, mucrone spinescente ad 3 mm. longo, multi-nervosa. *Palea* angusta, involuta, valvam fere aequans, 2-carinata, intra carinas approximatas profunde sulcata, extra eas utrinque 6–7 nervis. *Lodiculae* nullae. *Stamina* 6 ; filamenta praeter apices in tubum angustum coalita, 16–18 mm. longa ; antherae pallide luteae, anguste lineares, 6 mm. longae, loculis breviter apiculatis, apiculis ciliolatis. *Ovarium* breviter stipitatum, cum stylo 16–17 mm. longum ; stigmata albida, breviter plumoso-papillosa, 8 mm. longa. *Fructus* ignotus.

Dutch New Guinea. Without precise locality, *G. Versteeg*, 1132.

530. **Nephrodium (Lastrea) lichiangense**, *C. H. Wright* [Filices-Polypodiaceae] ; *N. Brunoniano*, Hook., affine, pinnulis anguste deltoideis rhachique dilute stramineo differt.

Plantae dense caespitosae. *Caudex* crassus. *Frondes* oblongo-lanceolatae, 23–38 cm. altae, pinnatae ; stipites 7 cm. longi, squamis lanceolatis vel ovato-acuminatis stramineis instructi ; rhaches stipitibus similes. *Pinnae* anguste deltoideae, 15 mm. longae, basi 7 mm. latae, basilares minores, alte pinnatim lobatae, utrinque squamosae ; lobi acute serrati, interdum mucronati ; venae saepius unifurcatae. *Sori* saepius prope costam uniseriales ; indusia pallide straminea, tenuiter membranacea.

China. North-west Yunnan ; in shady pine forests on the eastern flank of the Lichiang range, lat. 27° 10′ N., 3060–3670 m. alt., *G. Forrest*, 2300.

XXXIV.—A REVISION OF THE GENUS CYCNOCHES.

R. A. Rolfe.

HISTORICAL.

The genus *Cycnoches* for many years proved an inexplicable puzzle to botanists. Soon after the original species was described, in 1832, Lindley recorded the occurrence of a second form which he had no doubt was a distinct species until both forms were produced on the same plant. A few years later a similar phenomenon was observed in a second species, by Bateman, and the only suggestion offered was that the genus was in a so-called sportive condition, as in the case of the allied genus *Catasetum*. Darwin concluded that *Catasetum* had three forms of flowers, male, female and hermaphrodite, and was tempted to believe that a similar condition of things prevailed in *Cycnoches*. The mistake in the case of *Catasetum* has already been pointed out (Rolfe in Journ. Linn. Soc. xxvii. pp. 206–225, t. 8) and the object of the present paper is to clear up the confusion into which the history of *Cycnoches* has fallen.

The genus *Cycnoches* was established by Lindley in 1832 (Gen. and Sp. Orch. p. 154) upon a plant which had been sent from Surinam by Lance to Messrs. Loddiges, and which flowered in their nursery in May and again in the winter of 1832. The generic name was given in allusion to the gracefully curved column resembling the neck of a swan, and the species was called *C. Loddigesii*. Lindley remarked that he had only seen a single expanded flower. It was shortly afterwards figured (Lodd. Bot. Cab. t. 2000).

In 1836, when speaking of the curious behaviour of the genus *Catasetum*, Lindley remarked (Bot. Reg. sub t. 1951*) "I am acquainted with the following example of this tendency in a very different genus. In August, 1836, Mr. Wilmer, of Oldfield, near Birmingham, sent me a specimen of a *Cycnoches*, which had broad petals, a short column, hooded and dilated at the apex, and a broad roundish lip, gibbous at the base, and with its stalk much shorter than the column. It was, however, destitute of scent, while *Cycnoches Loddigesii* has, as is well known, a delicious odour of vanilla. I had no doubt of its being a distinct species, and called it

C. cucullata. But in the autumn of 1836, in the garden of the Horticultural Society, a plant of *Cycnoches* produced from the opposite sides of the same stem two racemes ; those of one raceme were the well-known fragrant flowers of *Cycnoches Loddigesii*, and of the other the scentless flowers of the new *C. cucullata.*"

In 1837 a second species of *Cycnoches* was described and figured by Bateman (Batem. Orch. Mex. et Guat. t. 5) under the name of *C. ventricosum.* It had been introduced from the neighbourhood of Istapa, Guatemala, by Skinner, and flowered in Mr. Bateman's collection at Knypersley. The figure shows an inflorescence, flowers, now known to be males, and a seed capsule, the significance of which will be presently apparent. Mr. Bateman remarked : "The capsule represented in the drawing adhered to the plant on its arrival in this country, and a most interesting relic it is, the huge size of the seed vessel being scarcely less remarkable than the extreme minuteness of the seeds, with an innumerable quantity of which it was at one time filled."

A year later a third species appeared, and was described by Klotzsch under the name of *C. chlorochilon* (Otto und Dietr. Allg. Gartenz. vi. p. 225). It had been sent from Caracas by Moritz, and flowered at Berlin. Shortly afterwards it flowered with Messrs. Loddiges, and was figured (Lindl. Sert. Orch. t. 16). About the same time it was figured by Maund (Botanist, ii. t. 54) under the name of *C. ventricosum*, from a plant which is said to have flowered with Messrs. Loddiges in August, 1837. It is not, however, Bateman's plant of that name.

In 1840 another species was described by Lindley, under the name of *Cycnoches maculatum* (Bot. Reg. xxvi. (1840), Misc. p. 10). It flowered in the collection of Mr. Barker, of Birmingham, and though thought to be Mexican was evidently from Venezuela, for it is added, "The species has also been found in La Guayra, by one of the collectors employed by Messrs. Hugh Low & Co., of Clapton ; " a locality subsequently confirmed.

In July, 1842, Bateman figured another species (Batem. Orch. Mex. et Guat. t. 40) whose history is so remarkable that it is here transcribed verbatim. "Among Mr. Skinner's earliest Guatemala collections, attention was particularly directed to the specimens of a plant, which to the habit of a *Cycnoches* joined the long pendulous stems of a *Gongora*, and for the possession of which, in a living state, no small anxiety was entertained. Some plants were speedily transmitted by Mr. Skinner, but these, on flowering, proved to be merely the old *C. ventricosum.* A mistake was of course suspected, and Mr. Skinner being again applied to, sent over a fresh supply of plants, for the authenticity of which he vouched ; but these were scarcely settled in the stove, when flowers of *C. ventricosum* were again produced. Mr. Skinner being importuned for the third time, and being then on the point of returning to this country, determined to take one of the plants under his special care and protection during the voyage, which, flowering on the passage, seemed to preclude the possibility of further confusion or disappointment. The specimens produced at sea were exhibited, and the plant itself was placed in the stove at Knypersley, where it commenced growing with the utmost vigour. The season of flowering soon arrived, but

brought with it a recurrence of the former scene of astonishment and vexation, for the blossoms, instead of those of the coveted novelty, were not distinguishable from the old *C. ventricosum*. These were still hanging to the stem when the inexplicable plant sent forth a spike of a totally different character, and which was, in fact, precisely similar to the specimens gathered in Guatemala, and to those produced on the voyage. It is at present impossible to attempt any explanation of so strange a phenomenon, especially on the supposition that the two forms of flower are analogous to the male and female blossoms of other tribes, for *C. ventricosum* alone not unfrequently perfects seeds. The species (if as such it may be regarded) was named in honour of Sir Philip Egerton, before any of its eccentricities had been discovered, otherwise the compliment might have been deemed a dubious one."

A year later Lindley published a very interesting figure (Bot. Reg. xxix. (1843) Misc. pp. 75, 77, with woodcut) which should have thrown further light upon the subject. He remarked: "On the 15th of September last, I received from Robert Steyner Holford, Esq., of Westonbirt, near Tetbury in Gloucestershire, a flower-spike bearing flowers of *Cycnoches ventricosum* and *C. Egertonianum*, *intermixed;* it was exhibited at a meeting of the Horticultural Society, and I now produce a figure of it. The plant which bore this specimen had been purchased by Mr. Holford of Messrs. Rollissons of Tooting as *Cycnoches ventricosum*." The figure shows two purple flowers of *C. Egertonianum*, one green flower, which Lindley called "nearly *C. ventricosum*, but its lip here and there raised into warts," and two flowers in a transition state so far as the shape and colour of the sepals and petals are concerned. Lindley was unable to offer any explanation of the significance of the phenomenon, merely remarking that with such cases all ideas of species and stability of structure in the vegetable kingdom were shaken to their foundation.

For some years no further case of this so-called sporting was observed, though other species were successively described, and in 1852 Lindley gave an enumeration of the "so-called species of *Cycnoches*" (Paxt. Fl. Gard. iii. p. 6), nine in number, remarking that five of them had not been known to sport. Two, however, are now excluded from the genus.

In 1852 *Cycnoches Warscewiczii* was described by Reichenbach (Bot. Zeit. x. p. 734) on what, from internal evidence and from a flower preserved in Lindley's Herbarium, is now known to be the female of some species of *Cycnoches*, but the material for its certain identification is still wanting. The species afterwards figured under the same name is quite different.

The discovery of sexuality in the allied genus *Catasetum* threw the first ray of light upon the subject, but the matter was never cleared up, and Darwin, in 1862, commenting on the cases already mentioned, remarked (Fertilisation of Orchids, ed. 1, p. 269), "From the analogous differences in the labellum of the sexes in *Catasetum* we may believe that we here see the male, female, and hermaphrodite forms of the *Cycnoches*."

In 1879 another remarkable example appeared, and was exhibited at a meeting of the Royal Horticultural Society on October 14th,

by Mr. W. Bull, of Chelsea, and also recorded and figured (Gard. Chron. 1879, xii. pp. 493, 505, fig. 78) as follows :—"Mr. Bull received a Botanical Certificate for *Cycnoches Warscewiczii*, a curious Orchid with green flowers borne on two separate spikes, those on one spike being much larger and totally different in appearance one from the other—so much so, that, seen separately, they would be taken as belonging to different genera. The explanation of this and of similar appearances in various species of *Catasetum* is now known to be that they are male and female flowers respectively. In the present instance the flowers on the shorter spike with the broad segments and simple lip are probably female, while the smaller and more numerous flowers on the long raceme (cut short in the figure), and which have a much divided lip, are male." It is not, however, the *C. Warscewiczii* of Reichenbach.

In 1889 a plant of *Cycnoches pentadactylon*, Lindl. in the collection of Mr. E. Gotto, The Logs, Hampstead Heath, produced flowers of both sexes, and a figure of each was published (Rolfe in Gard. Chron. 1889, vi. p. 188, fig. 26).

In 1891 a new species was described from the collection of Mr. H. J. Ross, of Florence, under the name of *C. Rossianum*, Rolfe (Gard. Chron. 1891, ix. p. 456). It had been purchased under the name of *C. Warscewiczii*, and had flowered on various occasions before January, 1889, when a female flower was produced and was sent to Kew for determination. Its origin was not known at the time, but the subsequent production of male flowers aud the discovery that there was only a single plant of *Cycnoches* in the collection revealed its identity. This was the first species described from materials of both sexes.

In 1891 the female of *Cycnoches chlorochilon* appeared in two different collections. In June of that year M. Houzeau de Lehaie, Hyon, near Mons, Belgium, sent to Kew male and female flowers of a *Cycnoches* received from Caracas. The male was the well-known *C. chlorochilon*, and though borne on a different plant there was little doubt that the female belonged to the same species. A month later both kinds of flowers appeared in an importation by Messrs. Sander, of St. Albans, but the three females were in each case borne on separate plants. Shortly afterwards, however, both sexes appeared on the same plant in M. Houzeau's collection, thus confirming their specific identity (Rolfe in Gard. Chron. 1891, x. pp. 69, 394).

By this time it had become increasingly evident that some mistake had been made with respect to *C. Egertonianum*, though materials were not forthcoming to clear up the mystery of Bateman's figure, which it was now certain showed two different kinds of male flowers on the same pseudobulb. Shortly afterwards the receipt of male flowers of another species afforded an opportunity for a comparison of all the materials available, and a re-perusal of Bateman's story suggested an explanation, namely that the green flowers shown on Bateman's plate were not drawn from the flowers direct, but were borrowed from an earlier drawing. The production of two kinds of male flowers on the same pseudobulb, as shown by Bateman, was certainly anomalous, and the remark that the flowers of "the old *C. ventricosum*" were "still hanging to the stem" when those

of the true *C. Egertonianum* appeared, and the fact that a similar confusion had led Darwin to the erroneous belief that there were three sexual forms of *Catasetum*, suggested the inference. These conclusions were published (Gard. Chron. 1892, xi. pp. 204, 205), when it occurred to me to write to Mr. Bateman, who was still living, and who replied that he remembered the circumstance perfectly, and the commotion it caused, but could not recollect exactly how the drawing was made, though with regard to all the circumstances mentioned he was inclined to concur in the suggested explanation. "As to the withered flowers," he added, "they remained many months on the plant, and were seen by many people, including Sir Philip Egerton, after whom the species was called." It is unfortunate that they were not preserved, or the mystery might have been cleared up earlier.

Confirmation of this view came about three years later. In the autumn of 1894 a living plant of a *Cycnoches* was received from the late Mr. Ricardo Pfau, of Costa Rica, and in the following spring a young growth appeared on the top of the old pseudo-bulb, which was taken off and potted, and the two plants were grown on side by side. In April, 1895, one of them produced a long raceme of purple flowers, which were identical with *C. Egertonianum*, Batem., while in June two green flowers, which it had been apparent for some time were females, expanded on the other plant (Rolfe in Orch. Rev. 1895, p. 233). One of these flowers is represented in the annexed figure (fig. 4), and a glance will show how distinct it is from the male of *C. ventricosum* (fig. 1), though the flowers are green in both. The illustration of the female of *C. ventricosum* (fig. 2) is taken from a sketch in Lindley's Herbarium, which is labelled, "Nat. size, Sir P. Egerton, Aug. 30/49," and is accompanied by a dried female flower, labelled "Sir P. Egerton, Oct. 1849." The male of *C. Egertonianum* is purple, much smaller than the other sex, and of totally different shape (fig. 3). The figures are approximately natural size.

Two other female *Cycnoches* have since appeared in cultivation, which cannot be certainly identified, though for geographical and other reasons they are suspected to belong to *C. maculatum*, Lindl., and *C. peruvianum*, Rolfe, while an additional Colombian species has been described, namely *C. densiflorum*, Rolfe (Kew Bulletin, 1909, p. 63), from a plant in the collection of the Rev. J. C. B. Fletcher, Mundham Vicarage, Chichester, which recently produced flowers of both sexes. A figure of the latter has been prepared for the Botanical Magazine (t. 8268).

THE SECTIONS OF CYCNOCHES.

It is unfortunate that the flowers produced by Bateman's plant were not preserved, for had this been the case the error would have been detected earlier. In 1891 I had indicated that the genus contained two distinct sections, one in which the two sexes were very similar in the perianth, the other in which they were very diverse (Gard. Chron. 1891, x. pp. 69, 70), though I then failed to detect the confusion between *C. ventricosum* and *C. Egertonianum*, and enumerated them as sexes of the same species. A few months

Fig. 1, male of *Cycnoches ventricosum* ; fig. 2, female.
Fig. 3, male of *Cycnoches Egertonianum* ; fig. 4, female.

later the error was discovered, and it was pointed out that not only were the two distinct but that they belonged to different sections of the genus, which were then named *Eucycnoches* and *Heteranthae* (Gard. Chron. 1892, xi. p. 205).

The two sections are distinguished by very marked differences in the perianth of the males—the females are similar in both except as regards size, and some minor differences in shape and colour. In *Eucycnoches* (which contains the original species of the genus) the sepals, petals and lip are fairly similar in the two sexes, though there are slight differences in size and texture. In the sexual organs the differences are very marked. In the male the column is very long and slender, and arched like the neck of a swan (in reference to which the generic name was given), bearing the anther at the summit, without a stigma or column wings, while the ovary is reduced to a simple pedicel. In the female the column is very short and stout, with a normal stigma, protected by a pair of triangular fleshy wings, without an anther, while the pedicel is much stouter than in the male, from the fact that it contains the incipient ovary. In the section *Heteranthae* the female is shaped as in *Eucycnoches*, but the male is usually very much smaller, the sepals and petals much thinner in texture, soon becoming recurved after expansion, and in some cases markedly different in colour, while the lip is reduced to a small, usually rounded disc, margined with clavate teeth. These characters are shown in the figures. Correlated with the smaller size of the males we find a greatly increased number of flowers, which are borne in a long pendulous raceme.

ENUMERATION OF SPECIES.

Section 1. Eucycnoches.

A. Both sexes known.

1. ♂ **Cycnoches Loddigesii**, *Lindl.* Gen. & Sp. Orch. (1832), p. 154; Lodd. Bot. Cab. t. 2000; Lindl. Bot. Reg. t. 1742; Kn. & Westc. Flor. Cab. i. p. 29, t. 15; Bot. Mag. tt. 3855, 4215; Hook. Cent. Orch. p. 43, t. 48; Harting. Parad. p. 21, t. 36; Lindenia, x. t. 436; Orch. Rev. 1907, p. 25, fig. 4.

♀ *C. cucullatum*, Lindl. in Bot. Reg. xxiii. (1837), sub t. 1951*; Rolfe in Orch. Rev. 1894, pp. 277, 354.

Native of Surinam.

2. ♂ **Cycnoches ventricosum**, *Batem.* Orch. Mex. et Guat. (1837), t. 5; also the green flowers shown on t. 40.

C. chlorochilon, Bean in Gard. Chron. 1888, iv. p. 326 (non Klotzsch).

♀ *C. ventricosum*, Batem.; Rolfe in Gard. Chron. 1892, xi. p. 205 (in note).

Native of Guatemala.

Most of the figures published under this name belong to *C. Egertonianum*, Batem., but that of Maund represents *C. chlorochilon*, Klotzsch. The female was received from Sir Philip Egerton in 1849, and is preserved in Lindley's Herbarium, but I find no record of it at the time, and although it was then thought to be ordinary *C. ventricosum*, the short column might have invited remark.

3. ♂ **Cycnoches chlorochilon**, *Klotzsch* in Otto & Dietr. Allg. Gartenz. vi. (1838), p. 225; Lindl. Sert. Orch. t. 16; Harting. Parad. p. 21, t. 35, fig. 2; Will. Orch. Alb. vi. t. 263; Gard. Chron. 1888, iii. pp. 144, 145, fig. 24; Ill. Hort. 1888, p. 81, t. 65; Reichenb. ser. 2, i. p. 83, t. 39, with fig. in text; Orchidoph. 1893, pp. 52, 53, with fig.; Journ. Hort. 1897, xxxv. p. 285, fig. 41; Rev. Hort. Belge, 1899, p. 25, with plate; Orchis, i. p. 60, t. 8.

C. ventricosum, Maund Bot. ii. t. 54 (non Klotzsch); Ann. de Gand, iv. t. 187.

♀ *C. chlorochilon*, Klotzsch; Rolfe in Gard. Chron. 1891, x. pp. 69, 394; Reichenb. ser. 2, i. p. 83, with fig. in text.

Native of Venezuela, Colombia and Surinam.

B. Male only known.

4. **Cycnoches Lehmanni**, *Reichb. f.* Otia Bot. Hamb. (1878), p. 10.

Native of Ecuador.

5. **Cycnoches Haagei**, *Rodr.* Gen. et Sp. Orch. nov. ii. (1881), p. 221; Bot. Mag. t. 7502; Cogn. in Mart. Fl. Bras. iii. pars v. p. 450, t. 91.

Native of Brazil.

6. **Cycnoches versicolor**, *Reichb. f.* in Gard. Chron. 1888, iv. p. 596; Cogn. in Mart. Fl. Bras. iii. pars v. p. 451.

Native of Brazil, and very nearly allied to *C. Haagei*, Rodr.

Section 2. Heteranthae.

A. Both sexes known.

7. ♂ **Cycnoches Egertonianum**, *Batem.* Orch Mex. et Guat. (1842), t. 40 (in part); Lindl. in Bot. Reg. xxix. (1843), Misc. pp. 75, 77, with fig.; Gard. Chron. 1843, p. 775, with fig.; Rolfe in Orch. Rev. 1907, p. 337. fig. 37; 1908, pp. 296, 297, fig. 38, 39.

C. ventricosum, Lindl. in Bot. Reg. xxix. Misc. pp. 75, 77, with fig.; Gard. Chron. 1843, p. 775, with fig.; Ann. de Gand. iv. p. 129, with fig.

C. ventricosum var. *Egertonianum*, Hook. in Bot. Mag. (1844), t. 4054; Hook. Cent. Orch. p. 44, t. 49.

♀ *C. ventricosum*, Lindl. in Bot. Reg. xxix. Misc. pp. 75, 77, with fig.; Gard. Chron. 1843, p. 775, with fig.; Ann. de Gand. iv. p. 129, with fig.

C. Egertonianum, Batem.; Rolfe in Orch. Rev. 1895, p. 233; 1908, p. 296, fig. 38.

Native of Guatemala.

This species has been much confused with *C. ventricosum*, Benth., belonging to the earlier section of the genus, as the above references show.

8. ♂ **Cycnoches pentadactylon**, *Lindl.* in Bot. Reg. xxix. (1843) Misc. p. 18, t. 22; Gard. Chron. 1889, vi. p. 188, fig. 26; 1893, xiii. pp. 597, 599, figs. 87, 88; 1909, xlv. p. 27, fig. 20; Journ. Hort. 1893, xxvi. pp. 94, 95, fig. 14; Gard. Mag. 1893, p. 77, with fig.; Bull. Soc. Tosc. Ort. 1893, p. 44, t. 2; Orch. Rev. 1893, p. 73, fig. 4; Cogn. in Mart. Fl. Bras. iii. pars v. p. 152, t. 92.

C. Amesianum, Hort. in Gard. Chron. 1902, xxxi. p. 218.

♀ *C. pentadactylon*, Lindl.; Rolfe in Gard. Chron. 1889, vi. p. 188, fig. 26; 1893, xiii. pp. 597, 599, fig. 89; 1909, xlv. p. 27, fig. 20; Cogn. in Mart. Fl. Bras. iii. pars v. p. 452, t. 92.

9. ♀ **Cycnoches stelliferum**, *Lodd.* Cat. Orch. (1844), p. 25 (nomen); Lindl. Bot. Reg. xxxii. sub t. 46.

C. Egertonianum var. *viride*, Lindl. in Bot. Reg. xxxii. (1846), t. 46; Day Orch. Draw. lii. t. 21.

C. Warscewiczii, Hort. in Gard. Chron. 1879, xii. pp. 493, 505, fig. 78; 1909, xlv. pp. 27, 29, fig. 21; Fl. Mag. 1879, t. 381; Orchidoph. 1881, pp. 101, 102, with fig.; Pfitzer Verg. Morph. Stud. Orch. p. 6, t. 1; Day Orch. Draw. xxv. t. 75.

♀ *C. Warscewiczii*, Hort. In each of the figures cited in the preceding paragraph the female flowers are also shown.

Native of South Mexico.

Quite distinct from *C. Warscewiczii*, Reichb. f., which I believe is the female of the following species.

10. ♂ **Cycnoches aureum**, *Lindl.* in Paxt. Fl. Gard. iii. (1852–3), p. 6, t. 75; Lem. Jard. Fleur. iii. t. 264.

♀ ? *C. Warscewiczii*, Reichb. f. in Bot. Zeit. x. (1852), p. 734 (non alior.).

Native of Central America.

The relationship of these two plants is a matter of inference. An authentic flower of *C. Warscewiczii*, Reichb. f., is preserved in Lindley's Herbarium. It was collected at Chiriqui, where Warscewicz also, according to Reichenbach, collected *C. aureum*. Lindley's Herbarium also contains part of an inflorescence with two male flowers, labelled by Reichenbach "*Cycnoches aureum*, Chiriqui Vulc., 6–8,000 feet, Oct., Warscewicz." *C. Warscewiczii*, Reichb. f., is almost twice as large as the female of the preceding species, which has been confused with it. Reichenbach himself suggested that his *C. Warscewiczii* might be a sex of *C. ventricosum*, Batem. (Walp. Ann. vi. p. 560).

11. ♂ **Cycnoches Rossianum**, *Rolfe* in Gard. Chron. 1891, ix. p. 456.

♀. The female was described at the same time.

Native of South Mexico and Central America.

12. ♂ **Cycnoches densiflorum**, *Rolfe* in Kew Bulletin, 1909, p. 63; Orch. Rev. 1909, p. 104, fig. 9; Bot. Mag. t. 8268.

C. glanduliferum, Rolfe in Gard. Chron. 1892, xi. p. 204 (non Rich et Gal.).

C. maculatum, Hort. in Gard. Chron. 1909, xlv. pp. 26, 27, fig. 19 (non Lindl.).

♀. The female was described and figured at the same time.

Native of Colombia.

B. Male only known.

13. **Cycnoches maculatum**, *Lindl.* Bot. Reg. xxvi. (1840), Misc. p. 10; Lindl. Sert. Orch. t. 33; Maund Bot. iv. t. 155; Ill. Hort. xx. p. 168, t. 143.

Native of Venezuela.

14. Cycnoches Dianae, *Reichb. f.* in Bot. Zeit. x. (1852), p. 636.
Native of Central America.

15. Cynoches glanduliferum, *Rich. et Gal.* ex Hemsl. in Gard. Chron. 1879, xi. p. 268.
Native of Mexico.
The plant shown in Richard's original drawing in Herb. Mus. Paris shows a pendulous raceme of four male flowers, but a detached fruit is also shown. Nothing further is known about the species.

16. Cycnoches peruvianum, *Rolfe* in Lindenia, vii. (1891) p. 29, t. 301.
Native of Peru.

Females of doubtful identity.

Cycnoches peruvianum, *Rolfe?*—In October, 1895, a female flower of Cycnoches was sent by Messrs. Sander & Co., St. Albans, which was said to have been imported with *C. peruvianum*, Rolfe, and may therefore belong to that species.

Cycnoches maculatum, *Lindl.?*—In October, 1903, a female flower of Cycnoches was sent by Messrs. Charlesworth & Co., Bradford, which is said to have been imported with *C. chlorochilon*, Klotzsch. It is not the female of that species, but as *C. maculatum*, Lindl., is known to grow with *C. chlorochilon*, and as the female sent has the sepals and petals spotted with brown, it is just possible that it may be the unknown female of that species.

SPECIES EXCLUDED FROM THE GENUS.

Cycnoches barbatum, Lindl. = Polycycnis barbata, Reichb. f.
C. Lehmanni, Nichols. = Lueddemannia Lehmanni, Reichb. f.
C. musciferum, Lindl. = Polycycnis muscifera, Reichb. f.
C. Pescatorei, Lindl. = Lueddemannia Pescatorei, Reichb. f.

XXXV.—MISCELLANEOUS NOTES.

Padi.—In connection with an investigation which is being carried out, at the Institute for Medical Research, Kuala Lumpur, F.M.S., by Dr. H. Fraser on the subject of Beri-beri, twenty-one samples of rice, collected by Dr. Fraser, were brought to the Jodrell Laboratory early in the year for examination. In the following list particulars of the various samples are given. Sir Patrick Manson, K.C.M.G., F.R.S., at whose instance the examination of these samples was undertaken and to whom a copy of the report on the samples has been communicated, writes that he has been informed that since "cured" rice has been adopted as the only form of rice in use in Government Institutions in the Straits Settlements and Federated Malay States, Beri-beri has disappeared from them. Sir Patrick Manson considers that it is desirable to publish the results of the examination of these samples.

List of Samples of Rice.

I. Untreated padi.
II. Padi after soaking 48 hours. Sent to laboratory wet.
III. Padi after soaking 48 hours and steaming. Dried in sun.
IV. Parboiled rice. Indian.
V. Parboiled rice. Penang.
VI. Parboiled rice. Asahan.
VII. White rice. Siam No. i.
VIII. White rice. Siam No. ii.
IX. White rice. Rangoon.
X. Malay rice. Usual Kampong variety.
XI. Malay rice. "Bras merah."
XII. Malay rice. "Bras hitan."
XIII. Malay rice. "Bras pulat."
XIV. Padi before soaking—in gum solution.
XV. Padi after soaking—in gum solution.
XVI. Padi after soaking, steaming and drying—in gum solution.
XVII. Parboiled rice. Indian—in gum solution.
XVIII. Parboiled rice. Penang—in gum sulution.
XIX. White rice. Rangoon " "
XX. Malay rice. " "
XXI. White rice. Siam " "

A number of rice-grains from the samples left at the Jodrell Laboratory by Dr. H. Fraser, Institute for Medical Research, Kuala Lumpur, F.M.S., have been examined, with the following results.—

Untreated padi, padi after soaking, and padi after soaking and steaming (samples I–III, XIV–XVI) show no distinct difference in the amount or distribution of the oil. The aleurone layer contains a considerable amount of oil; in the rest of the endosperm there is very little. Small drops of oil were found here and there in the cells of the outer layers of the endosperm, but usually none deeper than 3–4 layers beneath the aleurone-layer.

In the rest of the samples the aleurone-layer (as well as the fruit-wall, &c.) has been removed to a varying extent, only small remnants of it being left in some of the samples. In some cases (e.g. VII) this appears to have been done by some mechanical process, while in others (e.g. XI and XII) the partial removal of the aleurone-layer has evidently been effected by mites or weevils (one or both). In No. IV two living weevils and numerous living mites were found, and in some of the other samples living or dead mites were abundant, as well as an accumulation of their excrement. The excrement was specially abundant in Nos. IV and XII, and it appears to contain practically no oil. It seems probable, therefore, that, when rice is stored for some time, a great part of the oil may be removed, in consequence of mites, &c., feeding on the aleurone-layer.

In some of the cases in which the aleurone-layer was fragmentary (X, XI) it was found that a few fungal hyphae were occasionally present in cells of the aleurone-layer, but these hyphae were not abundant, and were probably of no particular significance. In X, XI and XII, of such aleurone-cells as were present, many contained only a very little oil.

One per cent. osmic acid was used to show the distribution of the oil. Chlorophyll solution and alkanna solution were used for comparison, the staining being carried out rapidly to avoid dispersal of the oil by the spirit.

There appear to be four or more varieties of rice among the samples. This might account for different amounts of oil being found, even in samples with intact aleurone layer.

Two suggestions may be made as a result of the examination :—

(1.) Can parboiling be advantageous in killing any mites, &c., present?

(2.) It may be possible that the excrement of the mites contains poisonous compounds, which would be injurious, if the powdery excrement were cooked with the rice.

L. A. B.

Botanical Magazine for June.—*Pinus Jeffreyi*, Grev. & Balf., is a Western North American species closely allied to *P. ponderosa*, Laws., some authorities regarding it as only a variety, differing in having longer, more rigid and more persistent leaves, yellow-green male flowers, and larger purple cones. Seeds of this Pine were first sent to Edinburgh in 1852, having been collected by J. Jeffrey in the Shasta Valley, North California. The drawing has been prepared from a tree grown at Kew. *Begonia modica*, Stapf, was first described last year in the Kew Bulletin from material sent to Kew by Mr. J. Anderson, and collected by him in the Gold Coast Colony. It flowered for the first time at Kew in September, 1908. It is a small-growing species, almost stemless, with peltate leaves, and small yellow flowers having two sepals and no petals. *Sorbus cuspidata*, Hedlund, is, from the size of its leaves and flowers, the finest of all the Whitebeams in cultivation, but though an old inhabitant of gardens in this country, having been introduced nearly eighty years ago, it is rarely seen of large size. In the Temperate Himalaya it is widely distributed, and sometimes attains large dimensions. The plate was prepared from a tree purchased from Messrs. Fisher, Son & Sibray, in 1904, under the name of *Pyrus Aria himalaica*. *Prunus japonica*, Thunb., from China and Japan, closely resembles *P. humilis*, Bunge, figured at t. 7335 of the Magazine, but it may be easily distinguished from that species by its glabrous branches, larger leaves and entire petals. Its bright red, cherry-like fruits are about $\frac{2}{5}$ in. in diameter and are extremely acid and astringent. The plate was prepared from a plant presented by Messrs. James Veitch & Sons in 1902. *Cornus macrophylla*, Wall., is distributed from the North-West Himalaya eastward to China and Japan. It reaches a height of about 17 feet in cultivation, and is the largest of the Cornels quite hardy in this country. The same plant was described by C. A. Meyer, as *C. brachypoda*, and much confusion has been caused by applying Wallich's name, which belongs to a species with opposite leaves, to a distinct plant with alternate leaves. To the latter the name *C. controversa*, Hemsl., has been given.

Illustrations of Cyperaceae.—When the publication of the diagnoses of the new genera and species of *Cyperaceae*, left in manuscript by the late Mr. C. B. Clarke, was announced (*Kew Bulletin* for 1908, p. 376), reference was made to the fact that Mr. Clarke, some years before his death had printed 144 plates of *Cyperaceae*, with corresponding explanatory text. As these plates aid in elucidating the views held by Mr. Clarke with regard to the systematic arrangement of the genera of *Cyperaceae*, a hope was expressed that these plates might be issued to the public as supplementary to the diagnoses of the genera and species published in *Kew Bulletin*, *Additional Series*, viii.

It has now to be announced that this hope has been fulfilled. On the appearance of the volume referred to, the executors of the late Mr. Clarke, decided to issue these plates at a nominal price with the object of placing at the disposal of botanists a further instalment of the results of his prolonged study of this natural family. The issue of the plates has been entrusted to Messrs. Williams and Norgate, who publish them in a well got up volume,* with an introductory note by Mr. B. Daydon Jackson, to whom, as has already been explained in this *Bulletin*, the task of collecting and editing the descriptions published last year, along with the scheme of arrangement adopted by Mr. Clarke in his manuscript monograph, had been entrusted. This introductory note explains that the series of plates was prepared "when the author had determined, not only upon his plan of arrangement, but also the representative and typical species in each genus. They were drawn by various artists, such as Mr. N. E. Brown, A.L.S., Miss Matilda Smith, and Mr. Charles Fitch; the greater part were reproduced by the collotype method, but some were lithographed." The explanatory page of text which faces each plate, supplies information concerning the figures, and in very many cases also regarding the specimens from which they were derived.

The plates thus possess an authoritative character, and the volume forms an indispensable complement to the eighth volume of the *Kew Bulletin*, *Additional Series*. The ordinal "Index Tabularum," supplied by Mr. Clarke with which the volume opens, has been supplemented by an alphabetical index at the end which adds greatly to the value of the work.

---

* Illustrations of Cyperaceae: prepared under the direction of the late Charles Baron Clarke, F.R.S., some time President of the Linnean Society of London: London (Williams & Norgate), 1909. Price 12s. 6d. net. Title, preface, Index Tabularum, pp. i.–ix. 144 plates, and as many leaves of explanation. Index, pp. 1–6.

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 7.] [1909.

XXXVI.—A REVIEW OF THE KNOWN PHILIPPINE ISLANDS SPECIES OF IMPATIENS.

J. D. Hooker.

The materials on which the following attempt to classify the known Philippine species of *Impatiens* is founded are the following :—

1, the published account of *I. Balsamina* in Blanco's Flora de Filipinas (1837) under the name of *I. triflora*, Blanco ;

2, the type specimen of *I. manillensis*, Walp. (1848), loaned to me by the good offices of the Keeper of the Royal Herbarium of Berlin ;

3, three species presented to the Kew Herbarium by Mr. Sebastian Vidal ;

4, ten species collected by Mr. A. Loher, a resident in Manila, and presented by him to Kew ;

5, a few species in the Herbarium of the Botanic Garden, New York, kindly loaned ;

6, herbaria made by various collectors (including Mr. Loher) subsequent to the occupation of the islands by the Government of the United States, brought together by Mr. Elmer D. Merrill* and kindly loaned to me for description, together with duplicate specimens of many presented to the Kew Herbarium. In this last collection the specimens are for the most part carefully numbered and ticketed as to locality and collector's name ; they do not together form part of a single Government Herbarium, but belong to various Government departments. It hence appears necessary when citing a number to add the name of the Herbarium in which the corresponding species is to be found. The Herbaria are designated as follows :—

Herbarium of the Bureau of Science.		
,,	,,	Government Laboratories.
,,	,,	Exploration of the Philippines.
,,	,,	Philippine Exposition Board.
,,	,,	Philippine Normal School.
,,	,,	San Fernando Provincial High School.

* Mr. Merrill is author of many papers on the Flora of the Philippine Islands, of which thirty-one, dating from 1903, are recorded in the library of the Herbarium of the Royal Botanic Gardens.

(13890—6a.) Wt. 108–471. 1375. 8/09. D & S.

The Bureau of Science herbarium is by far the richest in numbered species (about 20); it is followed by that of the Government Laboratories (about 10); the remainder are insignificant.

With regard to the classification of the species which I have adopted, it is obvious that *I. Loheri*, the single species with pedunculate inflorescence and alternate leaves, widely differs from all the rest; as does *I. Balsamina* by its alternate leaves from all others with simply pedicelled flowers. The division of the remainder into those with normal and those with exclusively cleistogamous flowers is forced upon me by the fact that I cannot identify the two species thus characterized with any of those bearing normal flowers; it remains for a local botanist to clear up their history. Of the species with opposite lower and whorled upper leaves, *I. polyactina* alone is remarkable for the number of whorls placed at regular intervals on its elongated stem and the almost complete suppression of opposite leaves; it is a near ally of the Javan *I. cyclocoma*, Miq.; it does not occur in any of the Government herbaria, only in that of the New York Botanic Garden. The subsection of species with subulate inter- or infra-petiolar glands is not a very satisfactory one, these being variable in number and position on the plant and not absolutely confined to the subsection. Of the floral organs the two lateral sepals are the most constant in size and form, but they do not afford sectional characters. The vexillum varies greatly in form in individual species, even from orbicular to oblately cuneiform and truncate; in some the costa is dorsally more or less thickened below the middle. I have adopted the remarkably deep sinus in the apex of the lobes of the wings, which is very conspicuous in some species, as a subsectional character; but it is a very unsatisfactory one. The labellum is long spurred in all the verticillate-leaved species, the spur varying in length The androecium is uniform throughout the verticillate-leaved species; it is very short, with the orbicular anthers connate by broad connectives and these with the very short subulate filaments into a ring with the anther cells introrse.

This is characteristic of a large proportion of the Malayan Archipelago species of *Impatiens*, of which *I. platyphylla*, Lindl. is the type, and which extends from Sumatra *via* Java, Borneo, the Celebes, and the Moluccas eastward to New Guinea and northward to the Philippines. *I. Loheri*, on the other hand, has long, broad filaments, and anthers with the connective produced into an appendage, a very different structure from the acute or acuminate anther of many Chinese and Indian species. The capsule in the whorled-leaved species is turgid and more or less gibbous in the middle, narrowed to both ends, polyspermous; the seeds are very small and usually more or less pubescent. In *I. Balsamina* the capsules are oblong, rounded at both ends, with many globose, naked seeds; in *I. Loheri* the capsule is straight, narrowed at both ends, with many glabrous seeds.

I have been led into detail on the organs of these Philippine Balsams from consideration of the great obstacles I have found in attempting to classify them, and the conviction that it is only by the study of living specimens that these and other difficulties will be overcome. In no genus of flowering plants known to me is the difficulty

of analysing herbarium specimens so great; the flowers must be moistened, dismembered under water on the stage of the microscope, and the organs laid out with every fold and wrinkle flattened; these should then be secured on slips of gummed paper and placed beside the specimen in the herbarium. In the field the specimens should be at once placed between sheets of absorbent paper in a portfolio along with dismembered flowers. I need hardly say that our knowledge of the genus as it occurs in the Philippines is hardly even elementary; the few recorded species are with few exceptions from Luzon alone, and I cannot doubt but that when the mountains of the Archipelago are further botanically explored the genus *Impatiens* will be found to be largely represented.

Clavis Specierum.

A. Inflorescentia simpliciter pedicellata :—
  Folia omnia alterna :—
    Folia serrata; capsula tomentosa. 1. *I. Balsamina*, L.
  Folia inferiora opposita, superiora 3–14-natim verticillata :—
    Flores normales :—
      Folia fere omnia 3–10-natim verticillata; verticilli perplurimi, caule elongato seriatim dispositi; folia lanceolata. 2. *I. polyactina*, Hk. f.
      Folia superiora tantum verticillata :—
        Verticilli superiores basi glandulis inter- vel infra-petiolaribus setaceis raro pulvinatis aucti (vide etiam *I. Klemmeana*, Hk. f.) :—
          Folia subtus glaucescentia vel albescentia :—
            Folia 6–15 cm. longa, ovato-lanceolata, spinuloso-serrulata, utrinque 6–8-nervia; flores 5–7 cm. expansi; sepala lanceolata, 8–10 mm. longa. 3. *I. Burkei*, Hk. f.
            Folia 8–15 cm. longa, ovata vel oblongo-lanceolata, subintegerrima, utrinque 5–7-nervia; flores 4–5 cm. expansi: sepala ovata, 4–5 mm. longa. 4. *I. Merrillii*, Hk. f.
            Folia 6–10 cm. longa, ovata, basi longe ciliata, utrinque 7–9-nervia; flores 2–2·3 cm. expansi; sepala lanceolata, 8–10 mm. longa. 5. *I. Hutchinsoni*, Hk. f.
            Folia 10–13 cm. longa, longe petiolata, oblonga, crenulata setulis interjectis, utrinque 7–9-nervia; flores ad 2 cm. expansi; sepala lineari-lanceolata, 12–14 mm. longa. 6. *I. Clemensae*, Hk. f.
            Folia 5–8 cm. longa, longe petiolata, ovato-oblonga, subcrenulata setulis interjectis, utrinque 5-6-nervia; flores ad 2 cm. expansi; sepala ovata, 6–7 mm. longa. 7. *I. biganensis*, Hk. f.
          Folia concoloria :—
            Folia 3–7 cm. longa, ovata vel ovato-lanceolata, fere integerrima, utrinque 5–6-nervia; glandulae interpetiolares capillares; flores 2–2·5 cm. expansi; sepala late ovata, longe pilosa, 5–7 mm. longa. 8. *I. caviteana*, Hk. f.

Verticilli basi eglandulosi, raro pauciglandulosi :—
Alarum lobi profunde vel late bifidi :—
Folia coriacea, argute spinuloso-serrata :—
Folia 5–6 cm. longa, ovato-lanceolata ; sepala 8–10 mm. longa, ovato-lanceolata ; semina 2·5 mm. longa, glabra. 9. *I. Elmeri*, Hk. f.
Folia membranacea vel papyracea, obscure serrulata, crenulata vel fere integerrima :—
Folia 6–15 cm. longa, oblonga vel ovato-lanceolata, utrinque 5–7-nervia ; sepala 6–7 mm. longa, ovato-lanceolata ; semina 4 mm. longa, hirsuta.
10. *I. manillensis*, Walp.
Folia pleraque 5–7-natim verticillata, 4–12 cm. longa, ovato-lanceolata, serrulata, utrinque 7–8-nervia ; sepala 7–9 mm. longa, ovata ; semina 2–3 mm. longa, puberula.
11. *I. quercetorum*, Hk. f.
Folia pleraque 3–5-natim verticillata, subsessilia, 3–6 cm. longa, lanceolata, superiora ciliata, utrinque 3–5-nervia ; sepala 7 mm. longa, ovata, glabra ; semina 3 mm. longa, hirsuta.
12. *I. Klemmeana*, Hk. f.
Folia superiora 5–7-natim verticillata, 3–8 cm. longa, subsessilia, lanceolata, ciliata, utrinque 5-nervia ; sepala 10 mm. longa, ovata, tomentosa ; semina 1·5–2 mm. longa, hirsuta et quasi pilis arillata. 13. *I. pubisepala*, Hk. f.
Alarum lobi apice rotundati, intrusi vel obcordati :—
Folia firma, argute serrulata :—
Folia 3–5 cm. longa, ovata, utrinque 5–6-nervia ; sepala ovato-lanceolata, 9 mm. longa, longe cuspidata. 14. *I. Mearnsii*, Hk. f.
Folia 2–3 cm. longa, pleraque ternatim verticillata, ovato-lanceolata, nervis utrinque 4 ; sepala ovato-rotundata, 5 mm. longa.
15. *I. Vidalii*, Hk. f.
Folia 2–5 cm. longa, pleraque 3–4-natim verticillata, nervis utrinque 4–5 ; sepala ovata, 6–7 mm. longa. 16. *I. Barnesii*, Hk. f.
Folia membranacea vel papyracea, integerrima vel obscure crenulata ; semina 2–2·5 mm. longa, pilosa :—
Caulis firmus, gracilis vel sat robustus :—
Folia pleraque opposita, 2–5 cm. longa, ovata, fere integerrima, utrinque 3–4-nervia ; flores parvi ; sepala ovato-lanceolata, 5 mm. longa. 17. *I. rizaliana*, Hk. f.
Folia pleraque opposita, 4–10 cm. longa, ovato-lanceolata, tenuiter membranacea, fere integerrima, utrinque 5–6-nervia ; flores 2·5 cm. expansi ; sepala ovata, 5–7 mm. longa. 18. *I. Ahernii*, Hk. f.

Folia pleraque verticillata, subsessilia, 4–8 cm. longa, lanceolata, utrinque 4–5-nervia, superiora saepe ciliata ; flores 2·5 cm. expansi ; sepala ovata, 6–7 mm. longa ; semina 3·5–4 mm. longa.

19. *I. montalbana*, Hk. f.

Caulis crassus, succosus, ramis flaccidis :—

Folia pleraque opposita, longe petiolata, 4–10 cm. longa, ovata vel oblonga, tenuissime membranacea, utrinque 4–8-nervia ; sepala ovata, 5–6 mm. longa.

20. *I. Ramosi*, Hk. f.

Caulis filiformis ; folia fere omnia opposita :—

Caulis simplex, erectus, gracillimus ; folia 5–10 cm. longa, lanceolata, utrinque 4–6-nervia ; sepala ovata, 6–7 mm. longa, cuspidata, glabra. 21. *I. filicaulis*, Hk. f.

Caulis vage ramosus ; folia 3–7 cm. longa, ovata, utrinque 4–5-nervia ; sepala ovata, 4 mm. longa, pilosa.

22. *I. Currani*, Hk. f.

Flores omnes cleistogami, minimi ; perianthii foliola deformia, plus minusve cohaerentia.—Herbae succosae ? erectae, ramosae, ramis gracilibus suberectis foliosis ; folia longe graciliter petiolata, 4–8 cm. longa, ovata vel ovato-lanceolata, integerrima vel crenulata ; pedicelli capillares :—

Labellum ecalcaratum ; capsula 7 mm. longa, uno latere turgida, utrinque acuta, 5-gona ; semina pauca, 2·5 mm. longa, obovoidea, compressa, laevia.

23. *I. cryptogama*, Hk. f.

Labellum calcaratum ; capsula 7–8 mm. longa, ellipsoidea, utrinque acuta, monosperma ? ; semina 3·3 mm. longa, obovoidea, compressa, puberula.

24. *I. cleistogama*, Hk. f.

B. Inflorescentia pedunculata :—

Herba elata, ramosa, glaberrima, macrantha ; folia alterna, petiolata, 8–12 cm. longa, ovata vel lanceolata, acuminata, crenato-serrata vel serrata, utrinque 7–9-nervia ; pedunculi foliis breviores, pauciflori ; sepala 2, late ovata, acuminata, 10 mm. longa ; vexillum dorso infra apicem rostratum ; alarum lobi ampli ; labellum poculiforme, basi rotundatum, in calcar breve attenuatum, ore horizontali acuto ; filamenta lata ; antherae didymae, appendiculatae.

25. *I. Loheri*, Hk. f.

Localities, Observations, &c.

1. **I. Balsamina**, Linn.—*Merrill* in Herb. Bur. Govt. Labs. n. 27 (1905). *I. triflora*, Blanco, Fl. Filipp. 636, non Wilid.

Luzon : prov. Tayabas, *H. N. Whitford*, Herb. Govt. Labs. n. 550 ; Paco. *Lucile Nunez* in Herb. Norm. School, n. 168.

Forma caule simplice erecto folioso et multifloro ; folia angusta ; labelli calcar limbum subaequans.

A common tropical form. A cultivated form, found as an escape, with the lobes of the wings subequal, stipitate and orbicular (forma *diplocycla*, nob) is in Herb. Bur. Sc., *Felicidad Nera*, and from the island of Panay, *Vidal*, n. 2238 in Herb. Kew; in Herb. Bur. Sc. n. 6087 there is an impoverished state collected in the province of Laguna by C. S. Robinson.

2. I. polyactina, Hk. f.

LUZON BOR.; Mt. Kiao, prov. Benguet, *R. S. Williams* in Herb. Hort. Bot. Nov. Eborac. n. 2012.

A remarkable species with long slender stems, divaricate branches, long and narrow leaves 2-3 cm. long. Its only near ally is the Javanese *I. cyclocoma*, Miq.—Not in Herb. Kew.

3. I. Burkei, Hk. f.

MINDANAO; *D. Burke* n. 1882, ex exempl. in Hort. Veitch cult.; Hort. Kew, 1897; Mt. Apo, alt. 200 m., distr. Davao, *De Vore et Hoover* in Herb. Philipp. Expos. Board n. 366; Mt. Halcon, alt. 1300 m., Mindoro, *M. L. Merritt* in Herb. Bur. Sc. n. 4391; *R. S. Williams* in Herb. Hort. Bot. Eborac. n. 3032, 2587.

The largest flowered Philippine Island species.

4. I. Merrillii, Hk. f.

LUZON; prov. Rizal, *A. Loher*, n. 6768.

Closely allied to *I. Burkei*, but smaller flowered and readily distinguished by the small sepals.

5. I. Hutchinsoni, Hk. f.

MINDANAO; Mt. Malingdang, prov. Misamis, *Major Mearns et W. J. Hutchinson* in Herb. Bur. Sc. n. 4564.

6. I. Clemensae, Hk. f.

MINDANAO; Lacus Lanas, Camp Keithley, alt. 750 m., *Mrs. Mary Strong Clemens* in Herb. Bur. Govt. Labs. n. 201.

7. I. biganensis, Hk. f.

LUZON; Cerro Bigan, Montalban, *A. Loher*, n. 1650 in Herb. Kew.

8. I. caviteana, Hk. f.

LUZON; Maragondon, prov. Cavite, *E. D. Merrill* in Herb. Bur. Govt. Labs. n. 4179.

9. I. Elmeri, Hk. f.

LUZON; Panai, prov. Benguet, sylvis alt. 2000 m., *E. D. Merrill* in Herb. Bur. Sc. n. 4705—Not in Herb. Kew.

10. I. manillensis, Walp. in Nov. Act. Nat. Cur. xix. suppl. (1843) 317; Walp. Rep. Bot. v. 382—*see* Appendix.

LUZON; Jala jala, *Meyen* in Mus. Bot. Berol.—Not in Herb. Kew.

I have carefully examined the type specimen of this plant kindly lent to me by the Berlin Museum authorities, and give in an appendix to this treatise a full description of it. When the allied species here enumerated are better known, it is probable that one or more may be referable to *I. manillensis* or to forms of it.

11. I. quercetorum, Hk. f.

LUZON; prov. Benguet, *Loher*, n. 1651 in Herb. Kew; Mt. Panai, quercetis alt. 2100 m., *Major E. A. Mearns* in Herb. Bur. Sc. n. 4417, 4360, 4381.

12. **I. Klemmeana, Hk. f.**

LUZON ; distr. Lepanto, rupibus alt. 1500 m., *W. Klemme* in Herb. Bur. Sc. n. 5688 ; flum. Bued, prov. Benguet, *E. D. Merrill* in Herb. Bur. Sc. n. 4301.

A very handsome slender species of branching habit, with fascicles of pedicelled flowers from the upper leaf-whorls. On an accompanying ticket is inscribed "Nov. 11,06, Cervantes Lilidan (Igo), 1500 m. on rocks in open." Closely allied to *I. montalbana*, but leaves nearly sessile and wing-lobes deeply cleft.

13. **I. pubisepala, Hk. f.**

LUZON CENTR. ; Cueva de Montalban, *A. Loher*, n. 1652 partim in Herb. Kew.

A single specimen ticketed as having been collected in the same locality and on the same day as *I. montalbana*, and bearing the same number, but a very different plant with flowers twice as large, 2·5 cm. long, broader and more deeply lobed wings, and hairy sepals 10 mm. long ; the seeds are much smaller. The foliage is alike in both.

14. **I. Mearnsii, Hk. f.**

LUZON ; prov. Benguet, *Major E. A. Mearns* in Herb. Bur. Sc. n. 3416—Not in Herb Kew.

I have seen but one specimen ; it is remarkable for its very stout stem and densely branched habit ; in its small serrulate leaves it resembles *I. Barnesii* which has fewer nerves in the leaves, and has smaller ovate sepals. It may, however, prove to be a very largely developed state of that plant. The fruit of both is unknown.

15. **I. Vidalii, Hk. f.**

INS. PANAY ; Miagas, *Seb. Vidal*, n. 2245 in Herb. Kew.

A stout much branched low herb (or undershrub?) with coriaceous recurved leaves. Fruit unknown.

16. **I. Barnesii, Hk. f.**

LUZON ; Baguio, prov. Benguet, rupibus calcareis alt. 1350 m., *A. D. Elmer* in Herb. Bur. Govt. Labs. n. 6065, et *P. Barnes*, n. 954.

17. **I. rizaliana, Hk. f.**

LUZON ; Montalban, prov. Rizal, rupibus calcareis, *E. D. Merrill* in Herb. Bur. Sc. n. 6234.

18. **I. Ahernii, Hk. f.**

LUZON ; Cayntang, Bosoboso, prov. Rizal, *Ahern* in Herb. Bur. Govt. Labs. n. 3367.

Mr. Merrill is disposed to regard this plant as *I. manillensis*, Walp. which has deeply cleft wing-lobes and is a much larger and broader leaved plant ; flowers about 2–2·5 cm. across.

19. **I. montalbana, Hk. f.**

LUZON ; Cueva de Montalban, *A. Loher*, n. 1652 in Herb. Kew : rupibus calcareis, *E. D. Merrill*, in Herb. Bur. Sc. n. 6235.

Closely resembles *I. Klemmeana*, q.v.

20. **I. Ramosi, Hk. f.**

LUZON ; Bosoboso, prov. Rizal, *Maximo Ramos* in Herb. Bur. Sc. n. 4573, 4672.

Varies greatly in the succulence of the stem and in the size and number of nerves in the leaves.

21. I. filicaulis, Hk. f.

Luzon ; Montalban, *A. Loher*, n. 6763, 6764.

Stem 8–15 cm. high, filiform ; leaves narrowed into capillary petioles 1–3 cm. long, entire or minutely ciliate or serrulate; pedicels much shorter than the leaves ; flowers 1·5–2 cm. broad, purple ; vexillum orbicular or cuneiform, costa dorsally keeled below ; lip scaphiform, acuminate, ascending ; spur 2·5 cm. long, very slender. Filaments minute. Capsule 9 mm. long, narrow, erect, turgid in the middle, narrowed to both ends, few-seeded. Seeds 2 mm. long, narrowly pyriform, compressed, hirsute, pale chesnut-brown.

22. I. Curranii, Hk. f.

Luzon ; prov. Cavite et Batangas, *H. M. Curran* in Herb. Bur. Govt. Labs. n. 7674.

A very slender flaccid diffusely branched herb with broader leaves than *I. filicaulis*, and hairy sepals, much smaller flowers and a turgidly gibbous many-seeded capsule ; seeds 2–2·5 mm. long, hispidulous.

23. I. cryptogama, Hk. f.

Luzon ; Montalban, prov. Rizal, *A. Loher*, n. 6752 in Herb Kew.

This and the following species are erect, much branched, probably more or less succulent herbs 3–4 dm. high, with in the dried state, dull green subtranslucent leaves and very few minute cleistogamous flowers and few-seeded capsules. Owing to the scarcity of flowers and shrivelled condition of the perianth segments I am very doubtful of the accuracy of my description. A careful search should be made for normal flowers of both species.

24. I. cleistogama, Hk. f.

Luzon ; Montalban, prov. Rizal, *A. Loher*, n. 6780 in Herb. Kew.

(*See* remarks under the preceding.)

25. I. Loheri, Hk. f.

Luzon ; Benguet, *A. Loher*, n. 1647 ; Mt. Data, alt. 2100 m., Lepanto, *E. D. Merrill*, in Herb. Bur. Sc. n. 4547.

A very handsome plant, 3–4 ft. high, with an apparently simple branched slender stem ; peduncles shorter than the leaves ; flowers 3–4 cm. broad, "pink, throat yellow, petals with many small purplish spots inside" (E. D. Merrill). Capsule 2·5 cm. long, linear-clavate, straight, acute, many-seeded ; seeds oblong, 3–3·5 cm. long.

Species indeterminatae.

Herb. Bur. Sc. n. 4672 "*I. manillensis*, Walp., Bosoboso, prov. Rizal, Luzon."—Certainly not Walper's plant ; it is remarkable for the uppermost leaves on the branchlets often being alternate ; habit and foliage of *I. caviteana*, but leaves opposite almost throughout the plant.

A. Loher, n. 1648, in Herb. Kew, from Payon, Benguet :—a very small species with opposite ovate leaves, minute flowers, ovate hairy sepals and a very shortly spurred lip.

A. Loher, n. 1649, in Herb. Kew "*I. radicans*, Bl., Cueva de Montalban"—not Blume's *I. radicans*; specimen in bad condition, resembles *I. Hutchinsoni* but wants interpetiolar glands.

Seb. Vidal, n. 2246, in Herb. Kew "Island of Panay"—a fragment resembling *I. montalbana*.

Appendix.

I. manillensis, Walp. in Nov. Act. Nat. Cur. xix. Suppl. (1848) 317; Walp. Rep. Bot. v. 382.

Ins Philipp. Manila, ad Jala jala, *Meyen* 8/31 in Mus. Bot. Berol.

Herba flaccida, glaberrima; caule erecto gracili ramoso. *Folia* 6–15 cm. longa, petiolata, inferiora opposita, superiora 3–5-natim verticillata, tenuiter membranacea, elliptica vel ovato-lanceolata, longe acuminata, subserrulata vel crenulata setulis minimis interjectis, subtus pallidiora, basi in petiolum 1–4 cm. longum angustata, nervis utrinque 5–7 gracillimis; glandulae stipulares 0. *Pedicelli* axillares, solitarii, 3–4 cm. longi, filiformes, ebracteati, fructiferi elongati. *Flores* 3–4 cm. lati, lilacini. *Sepala* 2, 6–7 mm. longa, ovato-lanceolata, longe acuminata, membranacea, oligoneura. *Vexillum* orbiculare, ad 14 cm. diam. *Alae* sessiles, ad 1·8 cm. longae; lobi apice dilatati intrusi vel bilobulati, lobulis inaequalibus divaricatis sinu saepe setifero; lobus basalis distali brevior et angustior; auricula dorsalis 0. *Labelli* limbus parvus, sepalis paullo longior, cymbiformis, ascendens, ore acuto; calcar 2·5–3 cm. longum, gracillimum, rectum vel incurvum. *Filamenta* brevissima; antherae connatae, obtusae. *Ovarium* rectum, acutum. *Capsula* 15 mm. longa, elliptica, utrinque attenuata, gibba, oligosperma. *Semina* anguste oblonga, 4 mm. longa, hirsuta.

Described from Meyen's type specimens in the Berlin Herbarium. The description by Walpers is incomplete, and the lower leaves are erroneously described as verticillate, and the upper as opposite; the petals (wings) are simply stated to be profundly bifid; the vexillum is not alluded to, nor are the capsules and seeds; the leaves are described as being glaucous beneath, but their undersurface is hardly paler than the upper. The perfectly glabrous, very membranous leaves and hirsute seeds are characteristic of *I. manillensis*.

In the Repertorium Walpers adds to the description in Nov. Act. "in vivo succulenta?"

XXXVII.—TOOWOOMBA CANARY GRASS.

(*Phalaris bulbosa*, Linn. = *P. commutata*, auct., non R. & S.)

Otto Stapf.

In the *Kew Bulletin* No. 2 of the present year (p. 79) an abstract was given of an account of a new fodder grass, "Phalaris commutata," which has recently been introduced into Australia and South Africa. In connection with it, it was pointed out that some difficulty exists as to what this plant "Phalaris commutata" may

be. Since then an article on the grass by Dr. Ewart, Government Botanist and Professor of Botany at the Melbourne University, in The Journal of the Department of Agriculture of Victoria, December, 1908, has reached Kew. In this article the author deals with the history and the hypothetical origin of the plant, and he also states that Professor Hackel, to whom specimens had been submitted, considered the grass "to be a new undescribed species intermediate between *Phalaris bulbosa*, L., and *Phalaris arundinacea*, L." A specimen of the grass was received at Kew from Professor Ewart in 1908, and it was then named *Phalaris bulbosa*, L. Further material has come to hand quite recently from Mr. J. H. Maiden, Sydney, and Mr. J. Medley Wood, Durban, and it is now possible to deal with the matter more fully.

The history of the grass is briefly as follows :—

About four or five years ago, Mr. Charles Ross, manager of the State Farm, Westbrook, Queensland, distributed in Australia a grass which was thought very likely to develop into a first-class fodder grass. It had been found by Mr. R. Harding, curator of the Toowoomba Botanic Gardens, Queensland, in out of the way places, such as hedgerows and rubbish heaps, in the gardens in his charge, and was assumed to be one of about 60 grasses received by his predecessor, the late Mr. Way, from the Agricultural Department of New York, U.S.A., in 1884. It is stated that since none of them were doing any good, on account of great drought, they were thrown away on a rubbish heap and lost with the exception of the one just mentioned. Subsequently further material was distributed from the Toowoomba gardens, and in 1906 it was already under trial on the Biggenden State Farm, Queensland (*Queensland Agric. Journ.* xvi., 394) and on the Bathurst Experimental Farm, New South Wales (*Agric. Gaz. N.S.W.* xviii., 700); it was at the same time recorded as doing very well in Gippsland, Victoria (*Journ. Dep. Agric. West Austr.* xiii., 381), and was in the same year exhibited at the September show of the Royal Agricultural Society at Adelaide (*Journ. Dep. Agric. South Austr.* x., 690). It soon acquired the reputation of being an excellent drought-resisting winter grass, and, in 1907, was on that account introduced into Natal (*Natal Agric. Journ.* xi., 1436).

The grass appeared in the Australian agricultural literature from the beginning as "Phalaris commutata," but it is not quite clear who is responsible for the name. There is very little doubt that it was meant to be a new name, although there is a *Phalaris commutata* on record, described by Roemer & Schultes (*Syst.* vol. 4, p. 403) as early as 1817. This is, however, a very dubious species, which was dropped long ago, and could hardly have been intended by whomsoever the name "P. commutata" was given to the Toowoomba grass. According to Bertoloni (*Fl. Ital. I.*, 343 ; see also *Parlatore, Fl. Ital. I.*, 70), the specimen from which Roemer & Schultes described their *P. commutata* consisted of a rhizome and the leafy stems of *P. bulbosa* and an inflorescence of *P. minor*, a statement which is borne out by the description in Roemer & Schultes' 'Systema.' The specimens received from Australia and from Natal agree perfectly, with this exception : that the specimen received from Professor Ewart has an unusually long and rigid

cylindric spike (16 cm. long) with somewhat smaller and narrower spikelets (5–5·5 mm. long instead of 6 mm.), the narrowness being mainly due to the keels being less widely winged. It has, however, to be pointed out that the spikelets are young and had to all appearances at the time of gathering not yet attained to their full size. This specimen was named *P. bulbosa*, L., at Kew, whilst Professor Hackel was inclined to consider specimens from the same source as a new species, *P. stenoptera*, so called on account of the narrow wings. The samples communicated by Mr. Maiden and Mr. Medley Wood are fully developed and certainly confirm the determination of the grass as *P. bulbosa*. They differ from the typical Mediterranean plant known under that name in nothing but the stouter stems and altogether more luxuriant growth and the obscure but still noticeable swelling of the basal internodes, a character to which the grass owes its name. The plant is, however, able to adapt itself to a great variety of external conditions, and the development of the vegetative parts vary accordingly. Fairly luxuriant specimens with slightly swollen basal internodes are extant in the Kew collections from Algeria, representing a strain such as might have given rise to the luxuriant Toowoomba race. It is stated by Dr. Ewart (*Journ. Dept. Agric. Victoria*, vol. vi., 1908, p. 739), that the Australian "P. commutata" differs from *P. bulbosa* and also from *P. arundinacea* in the absence of the three sterile glumes. If this were so, we should have to accept Hackel's view and treat the grass as a distinct species. The condition and number of the "sterile glumes" in the Toowoomba grass is, however, exactly the same as in *P. bulbosa*. The spikelet of *Phalaris bulbosa* is made up of five glumes. The two lowermost (glumes I and II) are by far the largest and act as an involucre. The two next following (glumes III and IV) are very much reduced; III is represented by a small cartilaginous scale with a tiny membranous appendage; IV by a similar slightly larger scale with a linear-subulate appendage, which reaches up to $\frac{1}{3}$ or almost $\frac{2}{5}$ of the last glume (V) which is fertile. In Hackel's terminology we would therefore have to speak of four "sterile glumes." As to the spikelets of *P. arundinacea*, they have the same number of "sterile glumes," but glume III is less reduced and very similar to glume IV, both being almost half as long as glume V. Under the circumstances there is no occasion for the assumption of a hybrid origin for the Toowoomba grass or for treating it as a new species. It appears to be simply a very robust race of the Mediterranean *P. bulbosa*, L. Whether it actually sprang up from seed introduced into the Toowoomba gardens from America will probably remain uncertain if we consider that 20 years elapsed between the receipt of a parcel of grass seeds from New York and the discovery of the grass on a rubbish heap, and that there is apparently no direct evidence of a connection between these two facts. Moreover there is nothing in the publications of the Agricultural Department of the State of New York to show that the grass was in cultivation or under trial in New York about the year 1884. Nor does it seem to have been grown anywhere else so far. On the other hand, its natural distribution from Portugal and Morocco to Mesopotamia, and the fact that it often occurs on cultivated ground, and particularly on

the borders of cornfields, suggest its accidental introduction with seeds from the Mediterranean region. Some authors prefer the name *P. nodosa*, L., to *P. bulbosa*, L., but Hackel explained in 1880 (*Cat. rais. Gram. Portug.* p. 2) why *P. bulbosa* has to stand, and it is hardly necessary to repeat his arguments.

How far the claims of the grass as a first-class fodder grass are justified is still to be seen, but the reports from Australia as well as from Natal are undoubtedly promising.

XXXVIII.—CUCUMBER AND TOMATO CANKER.

(*Mycosphaerella citrullina*, Grossenb.)

(With Plate.)

G. Massee.

Dr. Grossenbacher has recently described a disease caused by *Mycosphaerella citrullina*, Grossenb., which proves very destructive to melons in the United States. The disease is first indicated by the wilting of the leaves, after which the entire plant collapses and dies. The nodes of the stem, especially those nearest the root, present a water-logged appearance, often accompanied by an exudation of gum. At a later stage the diseased patches change to an ashy-grey or whitish colour, and the epidermis becomes broken up and studded with numerous perithecia belonging to the conidial stage of the fungus. This is followed by the production of the ascigerous condition of the fungus when the host is dying or dead. Infection experiments proved that the spores of the fungus could infect uninjured melon plants, also other allied plants, although curiously the cucumber proved immune, and resisted all attempts at infection in the United States.

Quite recently specimens of diseased tomato plants were received at Kew, from Waltham Cross. In each case the base of the stem was considerably shrunken, and the cortex destroyed, and studded with numerous minute perithecia, which on examination proved to be identical with the conidial or *Ascochyta* stage of the American melon disease. In some specimens the nodes of the stem were also attacked. Plants attacked as above promptly succumbed; a grower's statement being that they fell over like nine-pins.

Almost simultaneously with the above, a diseased cucumber plant was received from Gloucestershire, which showed the whitish diseased nodal portions of the stem, characteristic of the American melon disease. Numerous minute perithecia, which proved on examination to be those of the *Ascochyta*, were present on the diseased patches.

Cucumber plants attacked by this disease are stated to be quickly killed outright. Experiments conducted at Kew showed that the spores from diseased cucumber plants would infect young tomato plants, and that spores from a tomato plant would infect vegetable marrow plants. In both instances the plants infected showed the conidial (Ascochyta) stage of the fungus within a fortnight, and in both instances the lesions formed were characteristic.

TOMATO CANKER.

[*To face page* 292.

Both in this country and in the United States the conidial form of fruit is responsible for the rapid extension of the disease.

The simultaneous occurrence of this well-known American disease at two widely separated localities in this country is difficult to explain, as living melon plants are not imported, and the fungus does not attack the fruit.

Conidial form. Pycnidia depressed-globose, wall thin, parenchymatous, pale brown, mouth minute, distinct, 90–160 μ diam., produced under the epidermis, then bursting through; conidia hyaline, cylindrical, becoming 1-septate and slightly constricted at the centre, 9–16 × 4–6 μ.

Ascigerous form. Perithecia depressed-globose, rough, dark coloured, mouth papillate, becoming almost superficial, 100–165 μ diam.; asci cylindric-clavate, 8-spored; spores hyaline, oblong-fusoid, 1-septate, distal cell often largest, usually more or less constricted at the centre.

The result of preventive experiments conducted in this country are not yet recorded. According to Grossenbacher spore inoculations conducted in the field were almost complete failures, and it is considered that the very moist, warm environment of the greenhouse is essential for the infection and development of the fungus. Further experiments showed that the spores of the fungus are not killed by exposing infected soil to weathering conditions of winter, nor by fumigation with hydrocyanic gas. It seems that an epidemic may be prevented by spraying thoroughly with Bordeaux mixture before the disease appears, and repeating at intervals, to keep the plants covered with the solution.

J. G. Grossenbacher; N.Y. Agric. Expt. Sta., Technical Bull. No. 9 (1909).

XXXIX.—LIGNUM NEPHRITICUM.

(*Eysenhardtia amorphoides*, H.B.K.)

Otto Stapf.

Early in the present year an inquiry was addressed to the Director of the Royal Botanic Gardens, Kew, concerning the origin of Lignum nephriticum, a wood which formerly, but mainly during the seventeenth century, attracted a good deal of attention on account of its medical as well as physical properties, but subsequently was completely lost sight of. It had been referred by authors to various species; but it was quite clear that so far as the pharmacological literature was concerned, nothing definite was known as to its origin. The most remarkable character of the wood, and the one on which all the earlier writers insisted, was that a watery infusion of the wood assumed after a certain time a blue colour. In the Kew Museum the only sample professing to represent the product was a specimen which had been obtained from Messrs. Menier & Cie., Paris, as Bois néphrétique, in 1851. It was not named botanically, but had the appearance of a sapotaceous wood, and did not give the characteristic reaction with water. Linnaeus referred Lignum nephriticum to

the Horse-radish tree (*Moringa pterygosperma*). Although it was *a priori* very improbable that this identification could be correct, this wood too was tried, but with the same negative result. Similarly the wood of *Pithecolobium Unguis-cati*, which had also been credited with yielding Lignum nephriticum, was found to give no results. Hernandez, indeed, gave a description of the Lignum nephriticum plant, but it was too vague to serve as a guide. But he quoted two old Mexican vernacular names for it, Coatli and Tlapalazpatli. On looking through the Mexican literature on plant names I found in Ramirez and Alcocer's "Synonimia de las Plantas Mexicanas" two similar terms, viz., 'Coate or Coatl' and 'Tlapahoaxpatli' referred to *Eysenhardtia amorphoides*, and under *Eysenhardtia amorphoides* also the designation 'Leño nefritico,' but the authors gave no information beyond the bare names. There were, however, two timber specimens of *Eysenhardtia* in the Kew museum, and one of them, obtained from the Paris International Exhibition of 1900 was marked 'Cuatl.' This, when infused with water, gave the peculiar reaction of Lignum nephriticum in an unmistakable way. A comparison of Hernandez' description with herbarium specimens, and with technical descriptions of *Eysenhardtia amorphoides*, made it clear that this was actually the source of the old Lignum nephriticum. There might have been some doubt in so far as Hernandez described the flowers of his 'Coatli' as yellow whereas those of *Eysenhardtia amorphoides* are generally stated to be white; but a variety with yellow flowers has actually been recorded. Moreover one of the localities mentioned by Ximenes in his 'Quatro libros de la Naturaleza'—a work that, as will be shown, is based on a condensed version of Hernandez' manuscript—is practically one of the two places where Humboldt collected the specimens used in preparing the description of *Eysenhardtia*.

In the course of the present search for the lost wood so much information concerning the history of the wood and its medicinal use and peculiar physical properties has come to light that it seems worth while to give a connected account of the article, omitting any reference to the chemical nature of its active principle—an aspect of the enquiry which must be left over until an adequate quantity of material comes to hand to admit of research in that direction.

1. **The early history of the wood and its medicinal application.**—Among the many new and curious articles with which, after the discovery of America the Materia Medica of Europe was enriched there was a peculiar wood which had the reputation of being a certain remedy in disorders of the kidneys and the bladder. Nicolas Monardes, a learned doctor of Sevilla, writing in 1569* records that, 25 years before he had seen a pilot who was suffering from some trouble of the bladder, use a certain wood whereupon he recovered and enjoyed good health. Subsequently, he continues, this wood was frequently imported from Nueva España (Mexico) into Spain, and it was sold with such good profit that simultaneously a substitute appeared in the market. The genuine article, however,

* Monardes, Nic., Historia medicinal de las cosas que se traen de nuestras Indias occidentales, 1569; ed. ii., 1574, pp. 24, 58.

was easily recognised, as it alone possessed the remarkable property of causing clear water when soaked in it to assume an azure blue colour which gradually deepened, and this, as Monardes points out, in spite of the fact that the wood itself was whitish. Monardes knew of no name for the wood or for the tree, and simply classed it as 'palo para los malos de los riñones y de urina' or 'palo de la urina.' Nor had he anything to add as to the nature of the tree; but he described the wood as it was then imported as resembling that of the pear tree, and destitute of knots. Although a keen collector of American products, Monardes himself was never in America, which no doubt accounts for the scantiness of his information. To learn more about the wood we have to turn to his great contemporary, Francisco Hernandez, the Mexican explorer, who spent seven years in Nueva España. Unfortunately the records of Hernandez' work were almost completely destroyed in the fire of the Escorial in 1671, and only fragments and abstracts, made from them before the conflagration, have reached us; but even these fragments contain valuable information about the wonderful wood. The history, however, of the publications attributed to Hernandez, or connected with his name, is somewhat involved and requires explanation. Francisco Hernandez, physician at the Escorial and the court of Philipp II. of Spain, was, in 1570, commissioned by his king to explore Nueva España and report on its natural resources. He left the same year for the New World, with the title of Protomedico de las Indias, and stayed there until 1577, amassing an enormous amount of notes and illustrations which filled 24 or, according to some authors, 27 large volumes. They were, after his return, placed in the library of the Escorial, gorgeously bound up in leather, gold and silver,* but there seems to have been no money forthcoming for printing. Nine years later, in January 1587, Hernandez died, brokenhearted and worn out by intrigues, and the after effects of his strenuous labours. Not a line of his report had, up till then, been published. Subsequently King Philipp II. charged his physician, Nardo Antonio Recchi, of Monte Corvino in Italy, with the preparation of an abstract from Hernandez' voluminous manuscript, which was to contain all the information useful for the art of healing. This Recchi did, but he in turn did not live to see his epitome published. A copy of his compendium, however, revised by Francisco Valles, a Spanish physician of great reputation, somehow found its way to Mexico, where it was translated from the original Latin into Spanish, and, with numerous additions, was published by the Dominican Francisco Ximenes in 1615 under the title 'Quarto libros de la naturaleza y virtudas de las plantas y animales que estan recevides en el uso de Medicina en la Nueva España.' Meanwhile Recchi's manuscript had, after his death, passed into the hands of his nephew Antonio Petilio, in Monte Corvo, where, in the early years of the 17th century it was discovered by members of the Accademia dei Lincei, of Rome, which had then just been founded. One of the Lincei, Johannes Schreck, of Constanz, better known as Joannes Terrentius, was entrusted with the task of editing and annotating the chapters on plants,

* León, Bibl. Bot. Mexicana, Suppl., p. 307.

which he is stated to have done in the short period of one year, and presumably before 1611. In any case, by 1626 the preparation for the issue of the whole of Recchi's manuscript compendium was completed. The publication, however, did not take place until 1651, the title of the work being 'Rerum Medicarum Novae Hispaniae Thesaurus seu Plantarum Animalium Mineralium Mexicanorum Historia ex Francisci Hernandez Novi Orbis Medici Primarii relationibus in ipsa Mexicana urbe conscriptis . . . . .' No attempt was made, either in connection with this publication or otherwise, to draw upon the original manuscript in the Escorial, and when this place was destroyed by the great fire of 1671, the invaluable manuscript with its costly illustrations, together with countless other treasures, almost completely perished. Towards the end of the 18th century, however, a manuscript codex of five volumes, representing another epitomised version of Hernandez' reports, annotated and amended by himself, was found in the library of the Convent of San Isidro, in Madrid. Three of the volumes contained botanical matter; these were published as they stood in 1790 by Professor Gomez Ortega, under the title 'Historia Plantarum Novae Hispaniae.' Each of the three editions of Hernandez' work contains a chapter on 'Coatl,' that is, the tree yielding the wood which is the subject of this article; but although not exactly contradictory, the accounts vary considerably in extent and treatment, the fullest being that in Ximenes' 'Quatro Libros.' This work is extremely rare, and it seems therefore worth while to translate and reproduce the whole chapter *in extenso*, the more so as Ximenes had the advantage of being on the spot, and therefore able to add, as he almost certainly did, from his own experience. This is then the translation of Chapter xxv. of his 'Quatro libros':—

"Chapt. xxv. of that which is called Coatl.* The said Coatl is a *so-called* shrub, *although I have seen it taller than many a tall tree;* some also call it tlapal ezpàtli, or red blood medicine. It is a tall shrub with a stout stem, which is destitute of knots, after the manner† of a pear tree. The leaves are like those of the chick-pea, but smaller, or almost like those of the rue, but somewhat larger, *about half way between these two extremes*; the flowers are yellow, delicate (lazia), small and arranged in long spikes. It is cold and humid, though not far from temperate. It grows in moderately warm districts as that of Mexico, and in many warmer parts as in Guachinango,‡ *Chimalhuacan, Chalcoy, Tepuztla, and in almost the whole of the unhealthy country of Coyohuaca, and in many other parts.* The water with which chips of the trunk of the plant have been infused, assumes an azure blue colour, and if drunk,

* From internal evidence it is practically certain that the latter part of this account from "A Biscayan merchant . . ." onwards is an addition by Fr. Valles. It is absent in the edition of the Accademia dei Lincei of 1651, as are also the passages printed here in italics. Whether they are additions by Ximenes, or were taken over from Hernandez by Recchi in his condensed version, but struck out by Terrentius, is impossible to say, although the former is more probable.

† "manera de peral"; Monardes in speaking of the wood says, "Madera de peral." The Recchi edition of Hernandez has "materiae pyri,' and Ortega's no allusion at all to Pyrus.

‡ Guauhchinacensis" in Recchi's and Ortega's editions.

it refreshes and relieves the kidneys and the bladder, alleviates the acidity of the urine, extinguishes fever, heals colic pains, and it does all this with much greater force and efficiency if the root of the Maguey * is added, although it loosens the bowels. I have experienced this myself many times, and the same has been stated by others. It is said that its gum cures inflammation of the eyes and removes fleshy growths from them. It was first brought to Spain many years ago, and they call it there 'palo de los riñones' (kidney wood), and prepare the water in this way :—They make an infusion of the wood cut up into small chips and *of a moderate quantity of* clear water, *such as they drink ordinarily*, and let it stand until the water is taken and finished, when they make another infusion of the same chips, and that being used up, another, and repeat that as long as the water turns blue. *Those who change the chips every day are therefore much mistaken, and still more those who make drinking vessels out of the thick stem to drink from as the wood totally loses its efficacy within a fortnight if continually infused, and afterwards does not colour the water any longer.* As a rule the water turns a clear azure blue within half-an-hour, and the colour deepens as time goes on, so that it appears quite a miracle to those who look on. There is also another kind of this plant which possesses the same properties, but does not colour the water. A Biscayan merchant took more than fifty thick logs of that wood to Spain, and he told me that it served for many other ailments, and although we have not had so far any experience, we will on the authority of Monardes, the Sevilla physician, repeat what he says in his book in these words :—'They also bring from Nueva España a wood which resembles pear-tree wood, and is bulky and without knots, and they have used it for many years for diseases of the kidneys, the liver and urinary ailments. I saw it for the first time—about 25 years ago—when a pilot who was suffering from a weakness of the bladder and the kidneys used it and got well and hale. Since then I have noticed that much of it was brought from Nueva España, and that it was used for those ailments by those as well who discharged the urine with difficulty as by those who did it insufficiently, it thus being a remedy for obstructions, for which reason it also cures and heals the milt and the liver as has been found out a few years ago, and they find it very profitable. The water is prepared in this way. They take the wood, and cut it up into many fine chips, as many as possible and not very large, put them into clear fountain water, which has to be very good and pure, and keep them thus as long as they take the water. After half an hour a very light azure blue colour begins to show, and it becomes more and more blue, although the wood is white. They go on drinking the water, and with the water their wine and it has a very wonderful and obvious effect, without any inconvenience, and there is not more required than order and regularity ; nor does the water possess more flavour than if nothing had been put into it, for the wood does not affect it. Its complexion is warm and dry in the first degree.' So much according to Monardes ; on my own authority, I cannot say anything ; but I will say of that wood that in Sevilla

* "Metl," in Recchi's edition.
† "Lignum nefriticum" (Recchi's ed.).

I saw a certain person use it who had a piece, well—a span long. He divided it into two pieces and put them into a jar of water and left it there for six or eight days, and I saw him with my own eyes fill a chamber-pot to more than one-half every day, and at the end of 15 days, I saw him quite well, and yet before he had suffered much from retention of urine."

Hernandez' account of the Coatli and its peculiar reaction on water and medicinal use is supported by contemporaneous and quite independent witnesses, the monks Bernardino de Sahagun and Alonso de Molina. Bernardino de Sahagun went out to Mexico in 1529 and died there, probably towards the end of the century, at the age of 90. He left a manuscript of a 'Historia General de las Cosas de Nueva España,' which in 1829–30 was published in a Spanish, and in 1880 in a French, version (by D. Jourdanet and R. Simeon). To quote from the latter, he refers to 'Coatli' in these terms (p. 731): "There is a wild tree, know as Coatli, of which they cut rods for making baskets called 'uacales.' It is a supple wood, and if it is put in water, this turns blue. It is used medicinally for the urinary tracts." Alonso de Molina, who in 1571 published in Mexico a vocabulary of the language of the conquered Aztecs, also has the word 'Coatli,' and explains it thus: "Certain rods which are soaked and the water drunk thereof."

Although Hernandez' work remained unknown, outside a very limited circle, until 1651—for Ximenes' book is nowhere referred to in the medical or botanical literature of the time—the knowledge and the use of the wood for medicinal purposes spread early to Italy and other parts of Europe, no doubt chiefly owing to the unparalleled success of Monardes' book, which disclosed a new world of medicinal treasures to his contemporaries, and within a short time was translated into Latin (in five editions), English, Italian, and French. The complete absence, however, of information in Monardes regarding the nature of the tree from which the wood came rendered any attempt at botanical classification *a priori* illusory. Only Cesalpini,* with his usual ingenuity, hazarded a guess. Relying on the remarkable property of the Mexican wood of making water appear blue, and knowing that a similar effect was produced by soaking the inner bark of the ash in water, he suggested that the Mexican wood might also be referable to the genus *Fraxinus*. Caspar Bauhin accordingly placed this 'Lignum peregrinum aquam caeruleam reddens" in his Πιναξ (1623), p. 416, under *Fraxinus*, but otherwise nothing more was heard for a considerable time as to its origin. It was only through the publication of Recchi's condensed edition of Hernandez in 1651 that another interpretation of the wood, by that time generally designated 'Lignum nephriticum,'† became known. Terrentius, the annotator of Hernandez, concluded—as we shall see quite correctly—that the wood must be that of a Leguminosa. This he says (p. 119) is evident, not only from the leaves resembling those of the chick-pea and the yellow flowers, but also from its property of removing gravel, a property which is also found in *Genista* and almost all the

* Caesalpinus, De Plantis Libri xvi., p. 44.

† Parkinson, Theatr. Bot. (1640), p. 1664, is usually quoted as the author of this term.

'Leguminum genera.' Tournefort* also made an attempt to ascertain the origin of the remarkable wood when, during the eighties of the seventeenth century at Cadiz, he inquired for it and was given a dried branch of a plant which he described but could not classify. The description, however, shows clearly that he was misled, and it was so much at variance with Hernandez' account that no further notice was taken of it. More serious, however, was a mistaken suggestion made by Plukenet in his Almagesta,† as it was the origin of an erroneous identification which found its way into many books, even of our own day. Speaking of *Moringa Lentisci folio* (that is our *Moringa pterygosperma*, the Horse-radish tree of India) he adds: "Coatlis (quam alii Tlapolezpatlin, s. Medicinam sanguinis coccineam vocant) foliis Ciceris, vel Rutaceis; cujus lignum est Lignum Nephriticum Hernandez, apud. Recc. lib. 4. c. 25. de Laet.‡ Ind. Occid. lib. 5. carp. 3. Kircher. in Arte magn. lucis et umbrae. *Huic propius accedere videtur.*" Why Plukenet should have suggested an affinity—his statement does not amount to more—of the Mexican Lignum nephriticum tree and the *Moringa*, which he well knew came from Ceylon, is difficult to understand. However that may be, his suggestion of affinity was turned into a statement of actual identity in the third edition of Dale's 'Pharmacologia' (1737), p. 336, and it was equally apodictically repeated by Linnaeus in his 'Flora Zeylanica' (1747), p. 67, and 'Materia Medica' (1749), p. 69. It was thus duly hall-marked and widely accepted, although Murray§ pointed out in 1776 that Linnaeus' identification must be wrong. By this time the wood had ceased to be used and disappeared from the market, and probably very few of the writers of this and the following period saw it. In Pomet's 'History of Druggs' (1712), p. 62, it is still called a 'sovereign remedy' in stone and gravel, and Geoffroy, Tournefort's successor in the College Royal at Paris, also praises it as a very good aperient and diuretic and one of the best antinephritics known in 'Physick,' but 10 years later we learn from Joseph Miller's Botanicum officinale, p. 267, that it was only rarely used, and Linnaeus (l.c.) in 1749 declares it as 'exoletum.' Still, it must have been obtainable even then, for in the same year a dissertation by Beer Wolff‖ (praeside Joh. Fried. Cartheuser) was published which, among other things, had Lignum nephriticum for its subject. The writer used, no doubt, the genuine article, and classes it in the "aperitivis, laxantibus, strictis dictis et specificis lithontripticis." He tried to isolate the active principles which he recognised in a resinous and a gummose substance, but chiefly in the latter. This was the first and the last attempt in this direction, at least so far as Europe is concerned.

---

* Tournefort, Materia Medica, Ed. angl. (1708), p. 119.

† Plukenet, Almag. Bot., p. 253.

‡ This quotation is quite out of place. De Laet, in his Beschrijvinghe on West Indien, lib. v. cap. 3 (p. 173), speaks of a Copal called Quahuitl, and a Cuitlacopalli. Copalquahuitl is the Nauatl word for *Schinus molle*, and Cuitlacopalli, if not the same, stands for some other resin, as the whole chapter deals with scented resins and gums.

§ Murray, Appar. Medic. vol. ii., p. 522.

‖ Cartheuser, Joh. Friedr.—Praes. Diss. de Ligno nephritico, Colubrino et Semine Santonico. Resp. Tal. Beer Wolff, Francf. Viadr. pp. 4, 5.

Whether the wood fell into disuse because the medical practitioners did not find it so efficient as it was said to be, or because it could not compete with new and better drugs, or finally because it was not any longer possible to obtain the genuine article at a reasonable price, is uncertain. We have seen that a spurious article was in the field from the very first introduction of the wood into Europe, and as others followed, these substitutes may have helped to drive it out of the market. What the early substitutes were we do not know. Pomet,* who died in 1699, mentions a "red ebony or Pomegranate" from the (West) Indies and Brasil as one of the spurious Nephritic woods, and Cartheuser does the same. In the beginning of the last century *Pithecolobium Unguis-cati* became known as 'Nephritic tree,' and its wood was supposed to be the Lignum nephriticum of Hernandez. In this case, however, the application of the term 'nephritic' rested on the superstition of a pious Spanish bishop,† according to whom the kidney shape of the seeds of this plant indicated that it was to be used in diseases of the kidney. Even the "white poppy substance" about the seeds had its significance, standing for the fat of the kidney. Another substitute of more recent times was *Erithalis odorifera*,‡ a West Indian Rubiaceous tree, much valued for its hard, scented wood. In this case the confusion and the consequent application of the name Lignum nephriticum may have been due to the fact that the resin of this tree was recommended in cases of stranguria.§ In any case, so far as European literature is concerned, all knowledge of the Lignum nephriticum of Hernandez was by that time lost, and apart from Guibourt,‖ who describes the wood from undoubtedly genuine samples which he examined, it is not even mentioned in the principal compendia of Materia Medica of the last century, such as Kosteletzky, Nees, Geiger, Pereira, Flückiger, &c.

2. Lignum nephriticum of recent Mexican literature.—In the introduction to this article reference was made to Ramirez and Alcocer's list of Mexican vernacular plant names as the work containing the correct identification of Lignum nephriticum, although without any attempt in the way of explanation. The authors refer in their 'Sinonimia vulgar y scientifica de las Plantas Mexicanas' to publications by Villada (1883), Barcena (1891), and Urbina (1897), but as they are unknown to me they have been passed over; besides, from their titles they seem to be little more than catalogues. There may also be further contributions in modern Mexican literature, throwing light on the question; but if so, they have not been noticed in European journals and works on Materia Medica, and they are in any case inaccessible. There is, however, a paper by Dr. Fernando Altamirano which deserves being mentioned as it actually contains the solution of the problem of the origin of Lignum nephriticum, although involved in a very curious muddle. In an article on the medicinal *Leguminosae* of Mexico in volume iv. of 'La Naturaleza' (1878), pp. 97–99, he enumerates two plants under

* Pomet, Hist. Druggs, p. 62.
† Lunan, J., Hort. Jamaica, vol. ii., p. 2.
‡ Rosenthal, Syn. Plant. diaphor. p. 332.
§ Descourtilz, Fl. Pitt. Antill. vol. iv. (1827), p. 43.
‖ Guibourt, Hist. Nat. Drog. Simpl. vol. iii., p. 327.

the name of Coatli; one, 'Coatli (Serpienti de agua),' he identifies with "*Viborquia polistachia*, Ortega" (*Viborgia polystachya*), the other "Coatli, 2°" with *Eisenhardtia amorphoydes*, H. B. (*Eysenhardtia amorphoides*). The former he takes to be the Coatli or Tlapalezpatli described by Hernandez; the latter the second species mentioned, but not further described by him; but curiously enough, he says, Guibourt and others were mistaken in identifying the Coatli with the "Madera nefritica" (Lignum nephriticum), which is the wood of Taray or *Guilandina Moringa*, that is our *Moringa pterygosperma*. He evidently did not know the history of Lignum nephriticum, and relied blindly on the authority of Herrera, whom he quotes, and who in turn merely followed Linnaeus. He was also unaware that the names which he used in distinguishing his two kinds of Coatli are absolute synonyms. Altamirano further says the confusion of the Coatli and the *Moringa* was brought about by the fact that the latter is used in Mexico to this day for the same complaints for which the Aztecs used the former; we have, however, seen how the confusion actually did arise. Moreover, 'Taray' is given by Ramirez and Alcocer as a name used in several places for *Eysenhardtia amorphoides*, whilst *Moringa* does not occur at all in their list. According to Altamirano the Coatli is at present used only on farms to prevent sickness among fowls. For that purpose they make troughs of the wood and fill them with water for the birds to drink from, and the water is always blue; or if they use troughs of other material, they at least put a piece of Coatli wood into the water. But he thinks that the plant has been much underrated by modern pharmacologists and chemists. He also quotes Mar. Bárcena as having produced from it a yellow-brown substance with great staining power. As to the two Coatli, Altamirano calls the first "Palo dulce amarillo" and the other "Palo dulce blanco." "Palo dulce" is the common Spanish term for *Eysenhardtia*, and it would be interesting to know whether the adjectives 'amarillo' and 'blanco' refer to the colour of the flowers, corresponding to the yellow and the white variety, or to the darker heart wood and the whitish sapwood.

3. The fluorescence of Lignum nephriticum infusions.—We have seen that the earliest writers on Lignum nephriticum mentioned the peculiar property it possesses of rendering water blue when an infusion is made, and they insisted upon this as a specific criterion. This property surprised them the more as the wood itself was "white," which in this case probably only means 'of the colour of ordinary wood,' and not indicating the presence of any specific colouring matter that might yield a blue solution. Moreover, it seems to point to their having seen only pieces of sapwood, as the heart wood is of a dark brown or reddish-brown colour. It is curious that they did not mention that the blue colour of the infusion appeared only under certain conditions of illumination, a circumstance which must have added much to the miraculous character of the phenomenon. The first to give a fuller description of the changes of colour observable in an infusion of Lignum nephriticum was Johannes Bauhin.* Probably towards the end of

* Bauhin, Joann., Hist. Plant. vol. i., p. 492.

the sixteenth or it may have been in the first years of the following century he received from his learned colleague, Dr. Schopff, physician to the Duke [Friederich I.] of Württemberg, and by the order of the Duke, a cup made of 'Palum Indianum,' almost a span in diameter and of unusual beauty, and with it chips of the same wood of a reddish colour and without any definite taste. Of this he says in his 'Historia Plantarum,' under Lignum nephriticum : "The chips soaked in water coloured it in a short time wonderfully blue and yellow ; in obverse (reflected) light it exhibited in a beautiful way the changing colours of opal, so that it varied like that gem from brilliant orange, yellow and red to glowing purple and sea-green." Thirty or forty years later, a similar cup reached the German Jesuit and polyhistor Athanasius Kircher who then lived at Rome. It came to him from the Mexican procurator of his order, and so excited his wonder that after having experimented with it he presented it to the Emperor. He gave a full account of his experiments in his Ars Magna Lucis et Umbrae, which appeared at Rome in 1646. As this book is somewhat rare, and at the same time often quoted, a translation of the chapter is given here, omitting those parts which are more or less quotations from Recchi's manuscript which may have been accessible to him or from Ximenes' 'Quatro libros.' The chapter (p. 77) is headed "Experimentum de ligno quodam admirabili aquam in omne genus colorum tingente," and runs thus :—

"In this place we think we ought not to pass over a certain kind of white Mexican wood, called Coatl and Tlapazatli by the natives, for, although it has so far been found to colour water only blue, we have by continued experimenting ascertained that it may give the water any kind of colour which justly appears paradoxical . . . The wood of this tree is made into goblets, and it renders water poured into them intensely blue, of the colour of the flower of 'Buglossa' (*Anchusa*), and the longer the water stands in them, the deeper the colour. If then the water is poured into a glass globe and exposed to the light, no trace of the blue light will be left, and it will appear just like pure clear fountain water. If you move this phial towards a more shaded place, the whole liquid will assume a most delightful green colour, and if towards a still more shaded place, it will turn more or less red, and so change its colour in a wonderful way according to the nature of its surroundings. In the dark, however, or in an opaque vessel it will regain its blue colour. I was the first, I believe, to have observed this chamaeleon wonder in a cup which I received as a gift from the Mexican procurator of our Society, and I presented it afterwards to his Majesty the Emperor as something exotic and only known to few. At first I failed to understand the cause of the curious phenomenon which I examined as I saw that the colour could neither be classed as an apparent nor as a true, or material colour—not the former because it is a true and real colour in so far as it results from the nature of the wood and not from the various modifications of the light as is the rule with apparent colours ; and yet it cannot be considered as a real colour in so far as no colour is observable when the infusion is held up to the light, and the latter presents itself in different colours only if held against different objects ; but by

various experiments I found the cause out in the end and I shall disclose it further on . . . ." This, however, he never did. Not many years afterwards Robert Boyle, the celebrated English physicist took up the study of the optical properties of Lignum nephriticum infusions, and he published the results of his researches in his "Experiments and considerations touching Coulours" (1664), p. 203 et ss., devoting a whole chapter (Experiment X) to this subject. Whilst referring for details to his book, I may in this place point out, that Boyle here gave for the first time a precise and scientific description of the phenomenon, now known as fluorescence and so exquisitely presented by the infusion of this rare wood. He pointed out that the "tincture afforded by the wood must proceed from subtiler parts of it drawn forth by the water" and also showed that the colour effects disappeared on the addition of small quantities of acids, but reappeared on neutralisation with alkalis. How greatly he, and with him others, was impressed by the strange phenomenon, may be seen from the following quotation:—"These and other Phoenomena, which I have observ'd in this delightful Experiment, divers of my friends have look'd upon not without some wonder, and I remember an excellent Oculist finding by accident in a friends Chamber a fine Vial full of this Liquor, which I had given that friend, and having never heard anything of the Experiment, nor having any Body near him that could tell him what this strange Liquor might be, was a great while apprehensive, as he presently after told me, that some strange new distemper was invading his Eyes. And I confess that the unusualness of the Phenomena made me very solicitous to find out the cause of this Experiment, and though I am far from pretending to have found it, yet my enquiries have, I suppose, enabled me to give such hints, as may lead your greater sagacity to the discovery of the cause of this wonder." For that, however, the times were not ripe, and it was long before a satisfactory explanation of the phenomenon was given, not deduced, it is true from the Lignum nephriticum infusion—for this wood was by that time completely lost—but holding good for it. Boyle, in the course of his researches, became acquainted with Kircher's account, and was inclined to criticise it, but on the whole it is fairly correct as far as it goes. To judge from his description of the wood as white, he probably worked with sap-wood or young wood, and his infusions were accordingly light coloured, or they were greatly diluted, notwithstanding which they might in very strong light still have shown distinct blue fluorescence, and as to the variety of colours, Boyle himself came very near it when using a round phial. With a fairly strong infusion in a glass globe, and sunlight falling in through several windows in front, and with a dark background, all the beautiful colour effects described by Bauhin and Kircher may be obtained. In 1689 and 1690 Rud. Jac. Camerarius, who then occupied the chair of physics in the University of Tübingen, was engaged in similar researches, and published a "Schematismi Colorum infuso ligno nephritico propriorum," followed by a "Continuatio Tentaminum circa lignum nephriticum," but I have seen neither. Newton* also experimented

*Opticks, ed. iv., p. 166.

with the wood and attempted an explanation of the phenomenon; but by this time the wood must have been already very rare, and after him no physicist seems to have had a chance of working with it.

The writer's own experiments in this direction were mainly intended to make sure that the wood under examination was actually the Lignum nephriticum of the 16th, 17th and 18th centuries, and especially that of Bauhin, Kircher and Boyle, and they consisted, therefore, chiefly in the repetition of their experiments. And in so far they were perfectly satisfactory and conclusive. It is now to be hoped that sufficient material will soon be at hand to admit of the identification of the glucoside, or whatever the substance may be, to which the fluorescence is due. It may, in conclusion, be added that a decoction of leaves and fragments of young branchlets showed no trace of fluorescence, and that the outer sapwood seems to be poor in the fluorescent substance, whilst the best results are obtained with the inner layer of the sapwood and the outer heartwood zone.

4. **The mother-plant of Lignum nephriticum.**—*Eysenhardtia amorphoides* was discovered by Humboldt, near San Augustin de las Cuevas, to the south of the city of Mexico, also near Guanajuato, at an altitude of 2200–2400 m. San Augustin de las Cuevas is a village, a few kilometres to the south of Coyohuaca (or Coyohuacan), the place to which Ximenes refers in the passage "and in almost the whole of the unhealthy country of Coyohuaca." Of the other localities mentioned by Ximenes, Chimalhuacan is the name of a village and a hill southeast of the lake of Tezcuco, about 10 kilometres E.S.E. of the city of Mexico, Chalco, a town on the east shore of the lake of the same name, about 16 kilometres S.E. of Mexico, whilst Tepuztla is evidently identical with Tepozotlan, 16 kilometres to the north of the city. Guachinago, the only locality mentioned in the two other editions of Hernandez, is Guachinango or Huauchinango in the State of Puebla, and on the eastern edge of the Central Mexican plateau. All these localities are within the area of *Eysenhardtia amorphoides* as we know it at present. In the neighbourhood of Mexico and the adjacent states, *Eysenhardtia amorphoides* is fairly uniform, and forms a tree, or shrub with small, rather hairy leaflets, 3–7 (rarely 10) mm. long. This is the form described and figured by Humboldt, Bonpland and Kunth,* and also the same on which Ortega † based his *Viborquia polystachya*. Farther north, however, it is replaced by a form with larger, less hairy and more coriaceous leaflets, 10–17 mm. long. This ranges as far as Sonora in the north, and the Rio Grande to the north-east. There seems to be no difference except that in the leaves, and the two forms may best be treated at present as geographical varieties. As A. Gray ‡ described the latter of the two as var. *orthocarpa* of *E. amorphoides*, this name may be retained for it, although the name is misleading in so far as the original *E. amorphoides* is just as much "orthocarpa." The name was, in fact, chosen to distinguish this North Mexican plant from the

* Nova Genera et Species Plantarum, vol. vi., p. 491, tab. 592.
† Ortega, C. J., Nov. Rar. Plant. Dec. p. 66, tab. 9.
‡ Gray, A., in Smithson. Contrib., vol. v. (1853), p. 37.

Eysenhardtia of Texas, which has somewhat curved fruits, and was assumed to be the typical *Eysenhardtia amorphoides*. This was wrong, the Texas plant being a distinct species, described by Scheele * as *E. texana* as long ago as 1848, and confined to Texas and the north-eastern States of Mexico. Another species, *E. spinosa*, Engelm.,† is found in Chihuahua, and still another, *E. adenostylis* Baill.,‡ is recorded from Guatemala ; but whilst the former is well marked, the latter approaches very closely to *E. amorphoides*, and was, indeed, issued as such (Plant. Guat. Donnell Smith, 3746) on the authority of Micheli. None of these species have been examined for their wood, and there is no record of their being used or possessing properties similar to those of the Coatli, excepting a note by Dr. Palmer,§ according to which "the wood (of *E. amorphoides* var. *orthocarpa*) steeped in water makes a sweet refreshing drink, much relished by fever patients." The genus *Eysenhardtia* comprises thus three well distinguishable species which may be characterised as follows :—

Leaflets in 10 to over 20 pairs :

Fruits pendulous, lanceolate, straight, or almost so—

E. amorphoides.

Fruits erect, cultriform and often more or less curved—

E. texana.

Leaflets in 4–6 pairs ; fruits very short, obliquely ovate—

E. spinosa.

XL.—DIAGNOSES AFRICANAE : XXX.

1031. **Monotes glaber**, *Sprague* [Dipterocarpaceae] ; affinis *M. africano*, A. DC., a quo differt foliis utrinque glabris supra nervis lateralibus non impressis subtus rete venularum inconspicuo.

Arbor 12–18 m. alta, ligno duro. *Ramuli* lenticellosi, longitudinaliter rugulosi, glabri. *Folia* oblonga, elliptica vel obovato-oblonga, basi rotundata vel subcordata, apice rotundata vel leviter retusa, 4–7·5 cm. longa, 1·5–3·5 cm. lata, tenuiter coriacea, glabra, supra vix nitidula, nervis lateralibus inconspicuis, venulis crebre conspicue reticulata, subtus opaca, nervis lateralibus elevatis venulis inconspicuis ; nervi laterales utrinque 6–8 ; petioli 4–10 mm. longi, supra pilosuli. *Inflorescentia* ut videtur brevis, pauciflora ; rhachis et pedicelli pilosi. *Fructus* subglobosi, circiter 1 cm. diametro, tomentelli, umbone terminali 1–1·5 mm. longo, calycis aucti segmentis anguste obovatis 2·5–2·7 cm. longis 1–1·3 cm. latis supra minute stellato-pubescentibus subtus puberulis.

Rhodesia. Valley of the Hanyani River, *Allen*, 734 ; "South African Gold-fields," *Baines*.

According to Allen, *M. glaber* is a tree, 40-60 ft. high, with hard, durable wood. The native name is "M'waru."

Specimens of a shrub, 4 ft. high, collected by Kirk on the western slope of the Batoka Hills may possibly belong to *M. glaber*,

---

* Scheele, in Flora, vol. xxi (1848), p. 462.
† ex Gray in Bost. Journ. Nat. His., vol. vi. (1850), p. 174.
‡ Baillon in Adans. vol. ix. (1870), p. 239.
§ ex J. N. Rose in Contrib. U.S. Nat. Herb. vol. i. p. 96.

but the leaves are longer, and are plainly reticulate on the lower surface. According to Kirk, the bark is much eaten by elephants. These specimens are the type of *Vatica africana*, var. *glabra*, Oliv. (Fl. Trop. Afr. vol. i. p. 173).

1032. **Bombax brevicuspe**, *Sprague* [Malvaceae-Bombaceae]; foliolis obovatis breviter obtuse cuspidatis fructibusque obovoideis a ceteris speciebus africanis distinguitur.

Ramuli satis graciles, superne 2–3 mm. diametro, subappresse hirsuti, mox glabrescentes. *Folia* ut videtur 5-foliolata; petioli 2–4·5 cm. longi, subappresse hirsuti; foliola obovata, breviter obtuse cuspidata, in basin sensim angustata, 4–8 cm. longa, 2–4 cm. lata, coriacea, glabra, opaca, nervis supra inconspicuis vel prominulis subtus prominulis vel prominentibus; stipulae lanceolatae, acutae, 6–8 mm. longae, extra dense appresse hirsutae. *Capsula* late obovoidea, vel subfusiformi-obovoidea, circiter 7 cm. longa, 4 cm. diametro. *Semina* obovoidea, circiter 9 mm. longa.

Gold Coast. Subinisu, *Thompson*, 10; 12; Imbraim, *Thompson*, 31.

Native name "Nyinakobin," according to Thompson.

1033. **Pelargonium Woodii**, *N. E. Brown* [Geraniaceae]; affinis *P. schizopetalo*, Eckl. & Zeyh., sed foliis duplo longioribus ad rachim pinnatim lobatis parce pubescentibus nec tomentosis, lobis inferioribus ad basin bipartitis differt.

Caules non vidi. *Folia* usque 30 cm. longa et 9 cm. lata, pinnatim lobata, ambitu oblonga, versus apicem angustata, obtusa, utrinque tenuiter glanduloso-pubescentia; segmenta imbricata, late cuneato-obovata vel cuneato-orbiculata (inferioribus saepe bipartitis), apice rotundata, breviter 3–6-lobata, crenato-dentata. *Umbellae* longe pedunculatae, 6–8-florae, glanduloso-pubescentes. *Bracteae* numerosae, 5–6 mm. longae, 1·5 mm. latae, lanceolatae, erecto-patentes. *Pedicelli* 5–6 cm. (infra gibbum 1·5–2·5 cm.) longi. *Sepala* 1 cm. longa, 2 mm. lata, linearia, acuta, rubra. *Petala* 1·5–1·8 cm. longa, cuneata, multifido-laciniata, 2 postica straminea, antica carnea.

Natal. Drakensberg Range, *Wood*, 9287.

1034. **Combretum Stocksii**, *Sprague* [Combretaceae]; affine *C. molli*, Engl. et Diels, a quo indumento receptaculi notisque pluribus aliis recedit.

Frutex vagans, ramulis gracilibus cinereo-fuscis minute pubescentibus, novellis brunneo-tomentellis lepidotis. *Folia* opposita, ovata vel ovato-oblonga, basi rotundata vel subtruncata, apice acuminata, nervo medio in apiculum producto, 2·5–5·5 cm. longa, 1·2–2·5 cm. lata, ciliolata, supra in sicco brunnea, nitidula, lepidota, nervo medio utrinque pubescente, subtus viridula, dense lepidota, nervis lateralibus utrinque 6–8 prominentibus, crebre reticulata; petioli 3–5 mm. longi, lepidoti, supra dense pubescentes. *Spicae* axillares, in ramulis brevibus ortae, 1–2 cm. longae, 1–1·3 cm. diametro, confertiflorae, rhachi pubescente lepidota. *Bracteae* lineares vel subspathulato-lineares, 1–1·5 mm. longae, supra inferne glabrae, subtus lepidotae, superne longiuscule pilosae. *Receptaculum* inferius oblongo-ovoideum, tetragonum, vix 1 mm. longum, densissime lepidotum, superius infundibuliforme, 3·5 mm. longum, extra lepidotum,

sparse tantum pilosum, intus inferne glabrum, superne villosulum, disco nullo. *Calycis segmenta* depresso-deltoidea, circiter 0·7 mm. longa. *Petala* orbiculari-obovata, 1·7 mm. longa, 1·4 mm. lata, truncato-retusa, apiculata, glabra, viridulo-alba (teste *Stocks*). *Stamina* 4–5 mm. longa. *Fructus* desunt.

Portuguese East Africa. Mozambique, near Mocojo, north of the M'salu River, *Stocks*, 24.

1035. **Microloma spinosum**, *N. E. Brown* [Asclepiadaceae]; species affinis *M. Massoni*, Schltr., sed aphylla, ramulis brevioribus spinosioribus et corollae lobis intra tubum inflexis differt.

Fruticulus 30 cm. altus, ramosissimus, aphyllus. *Ramuli* 1·5–3 cm. longi, rigidi, spiniformes, pubescentes. *Flores* laterales, ad nodos fasciculati. *Pedicelli* 2–3 mm. longi, patule pubescentes. *Sepala* 2·5–3 mm. longa, 0·5 mm. lata, angustissime lanceolata, acuminata, patule pubescentia. *Corolla* 3·5 mm. longa, 2 mm. diam., tubularis, 5-angularis, apice 5-gibboso-crenata, extra glabra, intra prope medium fasciculis 5 pilorum deflexis ornata et superne pilis deflexis tenuiter pubescens; lobi 1–1·5 mm. longi, ovati, acuti valde concavi, intra tubum omnino inflexi et ei adpressi. *Folliculi* 2·5–3 cm. longi, lanceolati, attenuato-acuminati, velutino-puberuli.

German South-West Africa. Great Namaqualand, near Aus, 1200 m., *Marloth*, 4662.

1036. **Trichocaulon pictum**, *N. E. Brown* [Asclepiadaceae]; simile *T. cactiformi*, N. E. Br., sed corona non in tubum distinctum inclusa et coronae interioris lobis supra antheras productis differt.

Caulis subglobosus vel cylindrico-oblongus, obtusissimus, simplex vel basi tantum parce ramosus, 4–7 cm. longus, 4–5 cm. crassus, irregulariter tessellato-tuberculatus, glaber, tuberculis 6–10 mm. diam. obtusissimis primum minute apiculatis. *Flores* fasciculati, erecti, fasciculis 2–4-floris. *Pedicelli* 2 mm. longi, glabri. *Sepala* 1–1·5 mm. longa, late ovata, acuta, glabra. *Corolla* 9 mm. diam., glabra, extra laevis, intra minute rugulosa, glabra, pallida (albida vel lutescens ?) punctis parvis et lineis brevibus numerosis purpureo-brunneis notata; tubus late patelliformis; lobi patentissimi, 2·5 mm. longi, 3 mm. lati, late deltoideo-ovati, acuti. *Corona exterior* 5-loba, lobis 3-fidis 1·5 mm. longis fere ad sinus corollae attingentibus pallidis purpureo-brunneo-maculatis. *Coronae interioris* lobi 1·5 mm. longi, lineares, acuti, antheras excedentes apicibus connivento-erectis, pallidi, purpureo-brunneo-marginati.

South Africa. Little Namaqualand, *Marloth*, 4596.

1037. **Chironia (Plocandra) uniflora**, *A. W. Hill* [Gentianaceae-Chironieae]; species *C. Verdickii*, De Wildem., proxima; differt caulibus eramosis unifloris corollae lobis latioribus.

Suffrutex erectus, glaber. *Caulis* circa 30 cm. altus, 4-gonus, eramosus. *Folia* numerosa, anguste ovata, elliptica vel lanceolata, opposita, apice acuta vel acuminata, basi angustata, margine reflexa, 2–3 cm. longa, 3–6 mm. lata. *Flos* solitarius, terminalis. *Calyx* alte 5-sectus, 1–3 cm. longus, lobis ovato-lanceolatis acuminatis dorso paullo alatis. *Corolla* alba, circa 2 cm. longa, 5-loba, tubo anguste campanulato calyce breviore, lobis ovato-ellipticis acutis 1·5–1·6 cm. longis 6 mm. latis. *Stamina* parum sub loborum

sinubus inserta ; antherae rectae, 8 mm. longae, filamentis 2·5 mm. longis. *Ovarium* anguste oblongum, 7 mm. longum ; stylus 1·1 cm. longus. *Capsula* ignota.

Tropical Africa. Congo : Kundelungen ; in damp places, *Kässner*, 2784 ! (Herb. Mus. Brit.)

This species is distinct in having its tall erect stems unbranched above and terminated by a single white flower. In the structure of the flower and general appearance of the plant it comes closest to *C. Verdickii*, De Wildem. The calyx in the two plants is very similar, but the petals of *C. uniflora* are broader and shorter, and like that species it recedes from the other Plocandras in having straight anthers. In *C. angolensis*, to which this plant also shews some resemblance, the anthers are twisted.

1038. **Lycium leptacanthum**, *C. H. Wright* [Solanaceae-Atropeae]; species *L. arenicolo*, Miers, et *L. oxyclado*, Miers, affinis, ab hoc corollae lobis ovatis, ab illo floribus pentameris differt.

Rami tenues, albo-cinerascentes, laterales apice spinescentes. *Folia* fasciculata, oblanceolata, obtusa, 8 mm. longa, 1·5 mm. lata, glabra. *Flores* solitarii, pentameri ; pedicelli filiformes, 5 mm. longi. *Calyx* 5 mm. longus, apice pubescens ; tubus campanulatus ; lobi breves, irregulares. *Corolla* infundibuliformis ; tubus quam calyx paullo longior ; lobi ovati, 4 mm. longi, 2 mm. lati, breviter denseque ciliati. *Stamina* ad medium corollae tubi affixa ; filamenta inaequalia, 2 exserta, 3 inclusa. *Discus* parvus. *Ovarium* subglobosum ; stylus longe exsertus ; stigma capitatum.

South Africa. Cape Colony : Grahamstown, *Miss E. Cherry*, 934.

This species possesses characters so intermediate between *L. arenicolum* and *L. oxycladum* as to suggest that it may be a hybrid between them. The internal tissue of the corolla-tube below the insertion of the stamens breaks down at an early period and causes the tube to appear double.

1039. **Tragia** (**Tagira**) **Schweinfurthii**, *Baker* [Euphorbiaceae-Crotoneae] ; species *T. Hildebrandtii*, Muell.-Arg., proxima, sepalis floris foeminei apice 3-partitis differt.

Caulis simplex, erectus, 10–15 cm. altus, dense pilosus nec pilis urentibus hispidus. *Folia* sessilia, lanceolata, acuta, margine serrata, basi rotundata, 4–5 cm. longa, 1·5–2 cm. lata, subcoriacea, utrinque dense pilosa ; stipulae lineares, rigidae. *Racemi* breves, oppositifolii vel terminales. *Sepala* floris foeminei 6, pilosa, haud indurata, apice 3-partita lobis lanceolatis, nonnunquam lobulis lateralibus 1–2 parvulis secus rhachin additis. *Capsula* breviter hispida.

Tropical Africa. Nile-land : Dar Fertit, *Schweinfurth* III., 152 !

1040. **Neodregea**, *C. H. Wright*, gen. nov. [Liliaceae-Anguillarieae]; *Dipidaci*, Laws. ex Salisb., affinis, carpellis apice divergentibus ut in *Veratro*, Linn., differt.

Bulbus tunicatus. *Folia* caulina, alterna, sessilia. *Flores* pauci in spicam terminalem laxe dispositi. *Perianthii* segmenta 6, libera, breviter unguiculata. *Filamenta* filiformia ; antherae parvae, dorsifixae. *Ovarium* profunde trilobum, carpellis apice divergentibus, stylis distantibus ; ovula in quoque loculo circa 6, biseriata.

N. Glassii, *C. H. Wright* (species unica).

Herba 5 cm. alta. *Bulbus* ovoideus, 6 mm. diametro, tunicis obscure brunneis laevibus, membranaceis vestitus. *Caulis* erectus, filiformis, siccitate sulcatus, viridis. *Folia* 2, lineari-lanceolata, acuminata, 3 cm. longa, 4 mm. lata, glaberrima, membranacea; folium inferius longe vaginans, superius amplexicaule quam inferius minus. *Spica* floribus 2–4 distantibus composita; bracteae foliis similes, sed multo minores. *Perianthii* segmenta patentia, 7 mm. longa, 0·3 mm. lata, angustissime lanceolata, in parte superiore fere filiformia, basi supra unguem auriculata. *Stamina* 2 mm. longa; filamenta filiformia; antherae subglobosae, dorsifixae. *Ovarium* 2 mm. longum, viride; styli 3, subulati, ad angulos apicales exteriores ovarii affixi; stigmata punctiformia. *Capsula* loculicide dehiscens. *Semina* lenticularia, brunnea.

South Africa. Cape Colony: Albany Division, near Grahamstown, *Glass*, 674; Port Elizabeth Division, in damp ground, Cradock Place and Baakens River, *J. L. Drege*.

A fruiting specimen of this plant was received at Kew from Mr. James Glass in 1896, but flowers remained unknown until the recent arrival of Mr. J. L. Drege's specimens from Dr. Schönland, Director of the Albany Museum, Grahamstown. This species has the habit of a dwarf *Ornithoglossum*, the flower (except the ovary) of *Androcymbium*, and the ovary of *Veratrum*, but in the sum of its characters it agrees most with *Dipidax*. Although the perianth-segments are so narrow, yet they bear auricles just above the claw, such as are found more highly developed in the genus *Androcymbium*, and just indicated in *Dipidax*. The pistil at first sight appears to be apocarpous on account of the deep lobing of the ovary and the apical divergence of the carpels.

XLI.—KOKOTI.

(*Anopyxis ealaensis*, Sprague.)

T. A. Sprague and L. A. Boodle.

In May 1906 specimens of a large timber tree bearing the native name "Kokoti" were received at Kew from Mr. A. E. Evans, then Curator of the Botanic Station, Aburi, Gold Coast. The material, which was collected at Tarkwa, Gold Coast Colony, consisted of a branchlet bearing simple stipulate leaves, ternate at the nodes, and axillary, peduncled, dichasial or trichasial cymes of flowers. The most striking feature of the flower was a staminal tube resembling that of the *Meliaceae*, and it was at first supposed that "Kokoti" represented an undescribed genus of that family. When a full description of the species had been drawn up, however, it became evident that "Kokoti" presented a combination of characters which was unparalleled in *Meliaceae*: simple, ternate, stipulate leaves; gamosepalous calyx with reduplicate-valvate lobes, completely enclosing the corolla in the bud; petals trifid, inflexed in bud. It was eventually decided that the most natural position for "Kokoti" was in the family *Rhizophoraceae* near the genus *Macarisia*, with which it agreed in habit, inflorescence, and

the general nature and aestivation of the flower, as well as in most of the anatomical characters of the leaf and stem. The only important differences noticed between "Kokoti" and *Macarisia* were that the former had hypogynous flowers and a staminal tube, and the latter perigynous flowers and stamens free from one another. As both perigyny and epigyny are known in *Rhizophoraceae*, however, the hypogynous flowers of "Kokoti" would not exclude it from that family. There remained the union of the filaments into a complete staminal tube, but this, though very striking, could hardly weigh against the great general similarity in vegetative and floral characters. It is interesting to note that *Macarisia* was placed doubtfully in the *Meliaceae* by Meissner (Gen. p. 47), but all recent authors are agreed that it is Rhizophoraceous.

Comparison with the description of *Anopyxis*, Engler (*Engl. & Prantl, Nat. Pflanz. Nachtr.* ii. p. 49) suggested that "Kokoti" might be referable to that genus. *Anopyxis* was originally described as a section of *Macarisia* by Pierre (*Bull. Soc. Linn. Par.* n.s. p. 74), who based it on a specimen collected in the Gaboon by Klaine. Klaine's specimen included fruits but no flowers, whereas the flowers of "Kokoti" were known, but not the fruits. It was therefore impossible to ascertain whether *Anopyxis* and "Kokoti" were congeneric without actual comparison of the types. Owing to Pierre's death, however, his herbarium was temporarily inaccessible, and the description of "Kokoti" was accordingly held back until an opportunity should occur for examining the type of *Macarisia Klaineana*, Pierre (*Anopyxis Klaineana*, Engl.).

In the meantime De Wildeman described what is obviously the same tree as "Kokoti" as the type of a new genus and species of *Meliaceae*, *Pynaertia ealaënsis* in *Ann. Mus. Congo*, sér. 5, vol. ii. p. 262, t. 84. "Kokoti" has a sparingly pilose style, and *P. ealaënsis* is described as having a glabrous style, but there is no other difference. The stipules of *P. ealaënsis* are not figured or described, having evidently fallen off.

Pierre's herbarium was bequeathed to the Natural History Museum, Paris, and it has now been possible, through the courtesy of Prof. H. Lecomte, to examine the type of *Anopyxis Klaineana*. Comparison of this with "Kokoti" (*Pynaertia ealaënsis*) leads to the conclusion that the two are congeneric, but specifically distinct. The branchlets, stipules, buds, and the texture and venation of the leaves are almost identical, but the leaves of *A. Klaineana* are oblong and those of *P. ealaënsis* obovate or elliptic.

Little doubt now remains, therefore, that *Pynaertia* belongs to the *Rhizophoraceae*, and is congeneric with *Anopyxis* :—

1. The inflorescence and flowers of *Pynaertia* suggest affinity with *Macarisia*.
2. The fruit of *Anopyxis* is almost the same as that of *Macarisia*.
3. The external vegetative characters of *Pynaertia ealaënsis* and *Anopyxis Klaineana* are almost identical, apart from the shape of the leaves; and the anatomical characters of these two plants also show close agreement.
4. The vegetative characters, both external and anatomical, indicate affinity with *Macarisia*.

A revised description of the genus *Anopyxis* is now given, followed by an account of the leaf and stem anatomy of "Kokoti" (*Anopyxis ealaënsis*).

Anopyxis, Engl. in Engl. & Prantl, Nat. Pflanz. Nachtr. ii. 1900, p. 49.

Macarisia sect. *Anopyxis*, Pierre in Bull. Soc. Linn. Par. n.s. 1898, p. 74.

Pynaertia, De Wild. in Ann. Mus. Congo, sér. 5, vol. ii. 1908, p. 262, t. 84.

Flores hypogyni. *Calyx* gamosepalus, campanulatus; lobi 5, reduplicato-valvati. *Petala* 5, apicibus tridentatis in alabastro intra tubum staminalem inflexis. *Stamina* 10, monadelpha; tubus filamentorum cylindricus, apice 10-crenulatus; antherae inter crenulas sessiles. *Ovarium* sessile, depresso-globosum, 5-loculare; ovula pro loculo 2, collateralia, pendula. *Capsula* 5-locularis, loculicida; semina pro loculo 2, superne arillo membranaceo alata. Arbores altae, foliis ternatis vel quaternatis, stipulis interpetiolaribus solitariis; dichasia vel trichasia axillaria, pedunculata.

1. **A. Klaineana**, *Engl.* l.c.

Macarisia Klaineana, Pierre, l.c.

Folia oblonga, obtusa vel breviter obtuse acuminata, 11–13 cm. longa, 3·3–5 cm. lata; nervi laterales 12–13.

Gaboon. *Klaine*, 1308.

2. **A. ealaënsis**, *Sprague*. *Pynaertia ealaënsis*, De Wild. l.c.

Folia obovata vel elliptica, apice rotundata vel rotundato-cuneata, 6–11·5 cm. longa, 3–5 cm. lata; nervi laterales circiter 10.

Gold Coast. Tarkwa, *Evans*, 4.

Congo Free State. Eala, *Pynaert*, 1024 (ex De Wildeman).

According to Mr. H. N. Thompson, this species occurs in most of the forests of the Gold Coast Colony, where it is an important timber tree. Native name "Kokoti."

The anatomical characters of the leaf and stem in "Kokoti" are as follows:—

Leaf: Occasional solitary crystals of oxalate of lime in epidermal cells; stomata on lower side of leaf, variable in type, the arrangement of the adjacent cells being irregular, or approaching Cruciferous and Rubiaceous types; hypoderm (of 1–2 layers) on the upper side of the leaf; mucilage and tannin in many cells of the mesophyll; smaller veins embedded in the mesophyll, and accompanied by sclerenchyma above and below; midrib with a closed, somewhat flattened vascular ring; vascular system of petiole similar, but open on the upper side; hairs simple, unicellular.

Stem: Periderm superficial; inner walls of many of the cork-cells thickened; occasional sclerotic cells in the cortex; pericycle containing a sub-continuous ring of sclerenchyma and sclerotic cells; no hard bast in the phloem; wood-vessels with simple and also scalariform perforations; walls between vessels and parenchyma usually with large simple or slightly bordered pits; wood-fibres with bordered pits; medullary rays 1–2 cells broad.

The anatomical characters described above agree satisfactorily with those of the *Rhizophoraceae—Legnotideae*. A special comparison was made between "Kokoti" and *Macarisia pyramidata*,

Thouars,* and it was found that these two plants agreed in most of their anatomical characters. The chief points in which the latter species differs from "Kokoti" are: sclerenchyma on the upper side only of the smaller veins; vascular "ring" of the midrib open on the upper side; wood-vessels only rarely having scalariform perforations; cork-cells mostly thin-walled, thickening of inner wall only seen in a few cells; crystals of oxalate of lime in certain cells of both upper and lower epidermics of the leaf, instead of only in the lower epidermics, as in "Kokoti."

From the anatomical agreement it is evident that the affinity of "Kokoti" is with *Macarisia* and the *Legnotideae*. The close affinity between "Kokoti" and *Anopyxis Klaineana* is supported by their anatomical structure, which shows only trivial differences.

XLII.—MARINE ALGAE OF THE WEST OF IRELAND.

A. D. Cotton.

In April of the present year a Natural History survey was commenced of Clare Island and the adjoining mainland in the county of Mayo. The locality was selected on account of its relatively primitive nature, two of the principal objects of the investigation being—(*a*) a detailed study of the fauna and flora of a promising portion of the West Coast of Ireland; and (*b*) a comparative study of the fauna and flora of Clare Island with those of the mainland, with a view of elucidating the history of the fauna and flora of the island.

The survey will extend over a period of two or three years, and will be carried out under the leadership of Mr. R. Lloyd Praeger by means of monthly trips, except in the winter, when special visits will be arranged as occasion may require. A laboratory with necessary apparatus has been fitted up on the island, and there is hotel accommodation for a party of about twelve. Workers are still required in certain branches of both Zoology and Botany; but the services of a large number of specialists have been enlisted, and there is every prospect of the work being carried out in a thorough manner.

The algal flora of the West and South-West of Ireland is of special interest, and the neighbourhood of Clare Island is particularly suitable as a centre for investigation. In anticipation of the flora being rich, and considering the extent of ground to be worked, it was highly desirable that the study of the marine algae should be put in hand at once, the writer therefore joined the first collecting party which proceeded to Clare Island immediately before Easter. In addition to the ordinary work of the survey, opportunity was taken of enriching the Kew collections, by gathering and drying a number of specimens for the Herbarium, special

---

* For some of the anatomical features *Macarisia lanceolata*, Baill. was used instead of *M. pyramidata*.

attention being given to groups which are at present poorly represented. Material in formalin, of parasitic and endophytic algae, and of other species which cannot properly be examined in a dried state, was also obtained.

The first visit, necessarily more or less of a preliminary character, may be regarded as entirely satisfactory, both as to the suitability of the site for algal exploration and as to the amount of work that was accomplished.

Various types of collecting ground are met with. On Clare Island itself the rocky exposed shores offer a typically "exposed" flora. On the mainland such channels as Achill Sound afford quiet but fully saline conditions, where a "sheltered" type of flora exists, the growth here being often exceedingly luxuriant. Clew Bay, with its innumerable islands and sand banks, presents another and different type of vegetation, which may be termed a sand-bay flora, where every transition from exposed to sheltered conditions may be found. Land-locked bays, such as Bellacragher, furnish brackish water, where a fourth and characteristic vegetation obtains. Muddy ground with mud-loving species is also supplied in many parts of Clew Bay. To obtain a detailed knowledge of the algae of such a district, each of these types of collecting ground should be examined thoroughly, and that as often as possible throughout the year. Many of the smaller algae are very transient in their appearance, so that unless frequent collections be made, their presence is liable to be overlooked. It is thus manifest that, though an endeavour will be made to visit the Clare Island district as often as possible, any collections and observations by other botanists would be of great assistance.

The following is a brief account of the algological investigations during the Easter visit, the work on the island being first referred to, and afterwards that on the mainland :—

Nine days were spent on Clare Island, during which a general idea of the marine flora was obtained, and several positions were selected for the study of distribution. Special attention was paid to the last-named subject, as it is a branch of algology which has been almost entirely neglected in this country.

The shore on the west side of the island is practically inaccessible on account of the precipitous nature of the cliffs, but on the south and east sides there is excellent ground for collecting, though the frequency of swells and gales from the Atlantic make this sometimes a difficult, if not impossible, task. When such is the case, compensation may be found in the presence of a big "wash-up." The shores consist of rugged rocks and boulders, wide expanses of flat rock with various degrees of wave exposure, occasional lagoon-like areas of shallow water, and numerous deep rock pools ; whilst caves, sheltered creeks, and sandy bays may also be found. The water is clean, and apparently pure, the diatomaceous coating which frequently disfigures the Red Seaweeds being little in evidence. On the island the work was entirely confined to the study of the littoral flora, the investigation of the benthos being postponed until the summer. The littoral vegetation is plentiful and robust, although as usual on exposed coasts a dwarf growth of some species occurs.

With regard to the distribution of the larger algae, the factors of first importance would seem to be—(1) the temperature of the water ; (2) the salinity of the water ; and (3) the physical nature of the coast. When dealing with an area such as Clare Island, the conditions dependent upon these three factors are fairly uniform, and then the distribution of the algae and algal associations appear to be principally affected by conditions of illumination, desiccation, and exposure to waves and rough water. The respective influence of each of these may, to a certain extent, be readily observed. The effect of light may be studied in shady situations, such as caves or deep gulleys. The importance of not being exposed to dry air may be observed by means of rock pools, when it will be noted that sublittoral algae and species which are rarely uncovered by the tide can occur in pools nearly up to high-water mark, whilst the effect of breakers and rough water will be detected on passing from a fully exposed to a sheltered part of the shore. The influence of the first two factors is, no doubt, intimately connected, as sublittoral species have of necessity a diminished amount of light, but the presence of deep water algae in dark and partly dry caves would suggest that light, and not air-exposure, is often the determining factor.

The collections made on Clare Island contain numerous microscopic species. Several of these are new to Ireland, and quite as many supplied the first specimens from the British Isles for the Herbarium. A few species obtained were entirely unrepresented at Kew.

Turning now to the work on the mainland, one day at Mallaranny was all that could be spared for studying the sand-bay flora of Clew Bay. The littoral vegetation here is very meagre compared with that of the rocky coast of Clare Island, but a number of shallow pools and low rocks exist which support a flora characteristic of such a shore. Clew Bay is very suitable for dredging, and it may be confidently expected amply to repay careful investigation of the benthos.

A trip to Bellacragher Bay, an arm of Blacksod Bay, for the purpose of examining the brackish flora, was of special interest. At the particular portion of the bay visited, a Brown and Green Seaweed vegetation was much in evidence, whilst the Red Algae (*Florideae*) were almost entirely absent. A most attractive piece of work in such localities is to trace the gradual appearance of the different species of *Florideae*, as the more saline areas are approached. The flora of Bellacragher Bay is typical of a land-locked arm of the sea. It is largely developed in many of the Scotch lochs, and is well worthy of a more detailed investigation than it has hitherto received.

In striking contrast to Bellacragher Bay was the profusion of *Florideae* in parts of Achill Sound. Protected at each end from the open sea, yet feeling the full effects of the tide, the floridean vegetation in April was magnificent. Much of the Sound is completely uncovered at low tide, and the channels of rapidly-flowing water which are left, possessed in places a most luxuriant vegetation. Some very fine specimens were collected here for the Herbarium.

It is well-known that the phanerogamic flora of the West of Ireland presents features of remarkable interest. There is the striking mixture of South-west European plants with those characteristic of North America. *Erica mediterranea*, *E. Mackaii*, *Arbutus Unedo*, *Saxifraga Geum*, and *Pinguicula grandiflora* may be taken as representatives of the first group; whilst *Eriocaulon septangulare*, *Sisyrinchium angustifolium*, and *Spiranthes Romanzoffiana* are examples of the second. In addition to these there is the remarkable sight of such alpine plants as *Gentiana verna*, *Dryas octopetala* and *Euphrasia salisburgensis* growing in immense quantities right down to sea-level, and that in a warm humid climate. Lloyd Praeger has stated that such a startling mixture of types is not to be found elsewhere in Europe. In the case of the marine algae the same overlapping of northern and southern elements is, to a certain extent, known to exist, a fact which was strikingly verified in at least one instance during the Easter visit.

The explanation of these peculiar phenomena is one of the interesting problems before the biologists at Clare Island. It is too much to hope that a solution of such intricate problems will be effected by a local survey, but if only a more detailed account of facts be obtained, much good and important work will have been accomplished.

XLIII.—MISCELLANEOUS NOTES.

Mr. Robert Gill, a member of the gardening staff of the Royal Botanic Gardens, has been appointed by the Secretary of State for the Colonies, on the recommendation of Kew, a Curator in the Agricultural Department of Southern Nigeria.

Bust of Darwin.—The centenary of the birth of Darwin has been marked by the presentation to Kew of a bronze bust of this very distinguished naturalist. For this gift the institution is indebted to the generosity of the Bentham Trustees. The bust is the work of Mr. Horace Montford; it has been placed in Museum No. I., and was put in position on June 23, 1909, the central day of the Darwin Centenary celebration at Cambridge. At this celebration Kew was officially represented by the Director, who, on the same day, presented to the University the following address:—

Universitati Cantabrigiensi

S. P. D.

Quod etiam nos ad ferias natales viri clarissimi scientiarumque naturalium laude florentis Caroli Darwin concelebrandas invitastis gratias quam maximas vobis agimus. Nobis enim in honore praecipuo habendus vir quam eruditus tam liberalis, beneficiorum cujus ac munificentiae gratia botanices studiosi gaudent opus momenti maximi, **Index Kewensis Plantarum Phanerogamarum** nuncupatum, in usum publicum confectum atque editum esse.

Chinese Bamboo Ropes.—To the large and varied collection of articles made of bamboo contained in Museums Nos. II. and III., an interesting addition has recently been made in the form of a series of bamboo ropes. These have been presented by Mr. S. T. Dunn, Superintendent, Botanic and Forestry Department, Hong Kong. The ropes, which are made of split bamboo either twisted or plaited, vary in circumference from 1 ft. 6½ ins. to 1 in., and are employed for tying poles to the sides of junks and for towing purposes.

The following details accompanied the specimens :—

"The important industry of the lower part of the Yuen Fu River is in the cultivation of bamboos. The middle and lower slopes of the mountains are densely clothed in many parts with bamboo groves, and the ingenuity which is employed in transporting the cut bamboos from the mountains to Foochow is quite astonishing.

"Where there is water, even if it be only a small mountain stream, it is cleverly guided between ridges of shingle so as to provide a continuous channel, perhaps only a few inches deep, along which the bamboos can float. Where there is no water, smooth slides are made through the groves on the mountain sides, or on very steep rocky ground bamboo brackets are driven into the ground over which the bundles can be easily dragged.

"Once down to the main stream the bamboos are lashed together so as to form large rafts which can be poled or sailed down to the tidal waters and so to the market at Foochow.

"The usual means of progression of the passenger boat was by tracking.

"The width of the river Min, and the fact that the only available channel was often separated from the shore by jagged projections of rocks, rendered this operation one of considerable difficulty, and the highly specialized devices which have been evolved, doubtless by centuries of combat with these natural difficulties, are interesting to see. In the first place, the hemp ropes used largely in China for other purposes have proved quite useless for tracking because they would be frayed through in a very short time when strained, as is often necessary, over the rough granite rocks in the river bed.

"The rope that is used is made of thin strips of bamboo with the hard glazed side outward, plaited together so as to form a cord of about three-quarters of an inch in diameter. Should this become bruised by an accident during the day, the injured strips are removed in the evening and replaced by new ones threaded into the rope exactly in their place. It will give some idea of the strength of this tow rope when I say that the weight of 30 men pulling at one end was not sufficient to break it.

"I have been unable, so far, to identify the bamboo which is used in the manufacture of the tow ropes. It is called 'Mieng Deuk' by the river men."

With regard to the manufacture of these ropes, Mr. R. A. Currie, of the Chinese Imperial Customs Service, Swatow, wrote to Mr. Dunn under date October 12, 1908, as follows :—

"I have often seen the men making the plaited bamboo at Wahu on the Yangtze. The plait looks like what sailors call 'round sennit' or 'coach-whipping,' which is made with any even number

of ends. At Wahu they used to put up a tower of bamboo scaffolding about 50 ft. high, with a platform on top. Sometimes one man, but usually two, stood on this platform, their hands protected by enormous hide gloves and their bodies by hide aprons, plaiting the rope out of bamboo strips. The strips are prepared by men below and bundles of them are handed up as required. As the rope is plaited it passes down through a hole in the middle of the platform. When these bamboo ropes are worn out they are dried, cut into lengths of about 3 feet, and used as torches or for fuel. Most of these ropes are cored; sometimes the core is made of bamboo strips laid side by side; sometimes twisted, and were, in the best, of round sennit like the outside."

J. M. H.

Presentations to Museums.—The following miscellaneous specimens have recently been received :—

Price's Patent Candle Co., Ltd.—Series of products from the Cocoa Nut and African Oil Palms.

Mr. J. Burtt Davy, F.L.S., Department of Agriculture, Transvaal.—Samples of rubber from *Asclepias stellifera*, prepared by Mr. Ferraz.

Mr. F. W. Yates, Santa Barbara, California.—Photographic portrait of the late Dr. Lorenzo Gordin Yates.

Mr. S. T. Dunn, F.L.S.—Sheaths of a Bamboo known as 'Maw Chuk,' used for paper-making and as a covering for cushions, &c. Also sheaths of a Bamboo known as 'Lak Chuk,' used for basket-work and as wrapping for small parcels.

Linnean Society of London.—A collection of miscellaneous vegetable products, including samples of rubber, fruits, &c., from the collection of the late Mr. S. W. Silver.

Mr. W. H. Johnson, F.L.S., Director of Agriculture, Companhia de Moçambique, Beira, Portuguese East Africa.—Section of stem of the 'Makruss' or 'Zimbiti' tree (*Androstachys Johnsonii*). See *Kew Bull.* No. 5, 1909, p. 201.

Acme Flooring and Paving Co., Ltd., Victoria Park.—Flooring blocks of various woods, including Jarrah, Oak, Teak, &c.

Messrs. John Jackson & Co., West Croydon.—Plants of Black and White varieties of Mint.

Mr. H. N. Ridley, F.R.S., Director, Botanic Gardens, Singapore. —Fruits of *Raphia Hookeri*.

Dr. F. H. H. Guillemard, Trumpington, Cambridge.—Box made of Birch bark from Central Kamschatka. Photograph of monument erected to the memory of Rumphius in Amboina.

J. M. H.

Revision of Alexander Prior's Jamaica Collection.—In the *Kew Bulletin* for 1903, p. 32, Dr. Alexander Prior's bequest of his herbarium and botanical library to Kew was recorded. Special reference was made to his large collection of Jamaica plants made in 1849 and 1850. As these plants were not always authentically

named, or in part not named at all, Professor Urban, of Dahlem-Berlin, the greatest living authority on the flora of the West Indies, was applied to and asked to undertake the revision of the collection. To this proposition he very generously agreed, and the collection was submitted to him in instalments. The work has now been completed. It is of much importance to have the authority of Professor Urban for the names attached to the species of this collection, and in recognition of his kindness and courtesy a set of duplicates, selected from Alexander Prior's Jamaica collection, is being transferred to the "Krug et Urban Herbarium" of West Indian plants, which is deposited in the Museum of the Botanic Gardens at Dahlem-Berlin.

Botanical Magazine for July.—*Coelogyne venusta*, Rolfe, is a close ally of *C. Dayana*, Reichb. f., but it is a smaller plant, and is distinguished from all the species allied to it by the large size of the anterior lobe of the labellum as compared with the lateral lobes. It is a Yunnan species, whence it was introduced a few years ago by Messrs. F. Sander & Sons, of St. Albans, and the plant figured flowered in the Royal Botanic Gardens, Glasnevin, in 1904. *Aloe rubroluiea*, Schinz, is a native of the Kalahari Desert and German South-west Africa, and has been introduced into European gardens by Mr. Karl Dinter. It is a striking species, with long racemes of bright red and yellow flowers, which are $1\frac{1}{4}$ in. long. The figure was prepared from a specimen which flowered at La Mortola in November 1907, probably for the first time in Europe. *Rubus canadensis*, Linn., is widely distributed in Eastern North America, and is popularly known as the "Thornless Blackberry." It resembles in habit the common Raspberry, but has black fruits similar to those of the Blackberry. At Kew, where a plant presented by Professor Sargent of the Arnold Arboretum has been grown since 1902, it has borne the name of *Rubus Millspaughii*, proposed for it by Dr. Britton. *Pyrus Ringo*, Wenzig, is of Japanese origin, and is believed by Mr. C. K. Schneider to represent a cross between *P. spectabilis* and some form of the common apple. It has been in cultivation at Kew for many years, and as an ornamental tree, with its abundant pendulous fruits which become bright yellow in the autumn, it has no equal in the genus. *Mahonia arguta*, Hutchinson, was described for the first time last year, though it has been cultivated at Glasnevin for upwards of thirty years; otherwise its history is unknown, but it is presumed to be a native of Central America, from the fact of its affinity to *M. paniculata*, Oerst., and other Central American species. Its slender arching panicles of pale yellow flowers are a foot long or more.

Botanical Magazine for August.—*Caralluma Nebrownii*, Berger, is nearly allied to *C. lateritia*, N. E. Br., but differs in having much longer pedicels, a more rugose corolla of a blackish-crimson colour flecked with very small yellowish spots on the disk and at the base

of the lobes instead of a uniform brick-red. The corona is also larger. This plant is also allied to *C. huillensis*, Hiern, and *C. lutea*, N. E. Br. *C. Nebrownii* was discovered by Mr. Dinter near Barmen, in German South-West Africa, whence it was sent to the late Sir Thomas Hanbury at La Mortola. The plant figured flowered there in July, 1907, and again in November, 1908, when specimens were forwarded to Kew. *Cycnoches densiflorum*, Rolfe, is an interesting plant on account of the great diversity between the sexes, which, as in the present instance, are occasionally borne together upon the same pseudo-bulb. The male flowers have membranous perianth segments, yellow with red spots, and the labellum is reduced to a small circular disk surrounded by a number of clavate marginal appendages ; the column is long and slender. In the female flowers the perianth segments are greenish yellow and fleshy, the labellum is a large white ovate fleshy body, and the column is very short and stout. The plant was collected by Mr. Birchenall at Simacota, Colombia, and flowered in the collection of the Rev. J. C. B. Fletcher, Mundham Vicarage, Chichester, in November, 1908. An account of the genus *Cycnoches* was given in the last number of the *Bulletin*, pp. 268–277. *Erlangea tomentosa*, S. Moore, appears to be a polymorphic species rather widely spread in Tropical Africa. *E. fusca*, S. Moore, is the nearest ally, from which it is readily distinguished by the bright green leaves and the scariously edged involucral bracts. The plant figured was presented to Kew in April, 1907, by Mr. R. Diespecker, Adstock House, Winslow, by whom it was raised from seed. It has formed a shrub about five feet in height, resembling some Eupatoriums, and flowers freely and continuously during winter and spring. *Spiraea Henryi*, Hemsl., was one of the most beautiful deciduous shrubs in flower in mid-June, 1908. Belonging to the section *Chamaedryon*, it is most closely related to *S. canescens*, D. Don, and *S. Wilsoni*, Duthie. It was discovered by Mr. A Henry, in Hupeh, near Ichang, in 1885, but for its introduction to cultivation we are indebted to Messrs. J. Veitch & Sons, whose collector, Mr. E. H. Wilson, found it at Hupeh in 1900. According to Mr. Henry, the leaves are used by the poorer natives of Central China as a substitute for tea. *Agave Wrightii*, J. R. Drumm, the subject of this plate, is a member of the *Littaea* section of the genus, and is allied to *A. angustissima*, Engelm., and *A. geminiflora*, Scannag. The plant now figured was acquired for Kew from the collection of Mr. T. H. Kellock in 1903. Some confusion connected with the name *A. geminiflora* is cleared up in the discussion on the subject of this figure.

Vegetation of the Coast Region of Belgium.—Under the auspices of the Ministry for Agriculture the first part of a comprehensive work on the composition and distribution of the vegetation of Belgium has been issued from the Royal Botanic Garden of Brussels. The work has been undertaken by Professor Ch. Bommer and Professor J. Massart, and will comprise about 400 plates, about 1 foot by 1 foot 4 inches, divided into five parts : I. Districts Littoraux et Alluviaux ; II. Districts Flandrien et

Campinien ; III. Districts Argilo-sablonneux et Cretacé ; IV Districts Calcaire et Jurassique ; V. District Ardennais. Part i., by Prof. Massart, consists of an octavo volume of tables, maps, and 82 views, about $2\frac{1}{2}$ inches by $4\frac{1}{2}$ inches, reproduced from photographs, and a folio volume of 86 plates, 18 inches by $22\frac{1}{2}$ inches, outside measurement, and weighing about 15 lbs. The dimensions and weight are given because they are the only objections to an otherwise excellent work. It is true that they give scope for a very magnificent series of photographs, but for all practical purposes, Karsten and Schenck's "Vegetationsbilder," about a third of the size, are sufficiently large for educational purposes, since they can be more easily handled and more easily stowed.

Apart from this objection there is nothing but praise for this great undertaking, and the part treating of the coast vegetation, both natural and artificial, is highly interesting and instructive, and will serve as a foundation for future comparisons. Maps and photographs of different dates illustrate the gain of land and the increase in height of the sandbanks or dunes, whilst others show the ravages caused by unusually high spring tides and sea storms. In spite of all precautions inundations are sometimes very disastrous. *Ammophila arenaria* is extensively planted in the blown sand, which is prepared for the purpose by rows of deeply embedded thorn branches. Potatoes are one of the earliest cultivations in the reclaimed land. Pines and poplars are the principal trees planted for shelter. The general title of the work is "Aspects de la Végétation en Belgique," and the special title of part i. is "Essai de Géographie Botanique des Districts Littoraux et Alluviaux de la Belgique." It may be added that much of the material had previously appeared in the "Bulletin de la Société Royale de Botanique de Belgique," vol. xliii. and onward.

W. B. H.

Para rubber.—Mr. W. H. Johnson has published a second edition of his book "The Cultivation and Preparation of Para Rubber" which has been rewritten and considerably enlarged. There are numerous illustrations. The subject matter is collected together in fifteen well arranged chapters.

1.—

2.—

[*To face page 321.*

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 8.] [1909.

XLIV.—ECANDA RUBBER.

(*Raphionacme utilis*, Brown & Stapf.)

In the *Kew Bulletin*, 1908, pp. 209–215, and pp. 305–307, an account has been given of *Raphionacme utilis*, Brown & Stapf, and of the rubber prepared from its tubers. Since these accounts were published Mr. John T. Norman, of the City Central Laboratory, London, E.C., has sent a further consignment of the tubers of the Ecanda rubber plant, which were brought over from Angola by his client, Mr. J. Neale May.

Mr. May holds a large concession of land near Bihe, Angola, where *Raphionacme utilis* grows in abundance, and he has kindly furnished particulars as to the mode of growth of the plants under natural conditions and of the country in which they are to be found. From this information the following account has been written.

The tubers of Ecanda rubber recently received at the Royal Botanic Gardens came from a plateau near Bihe, in about 17° E. long. and 12·5–13° S. lat., at an elevation of 5,000 ft. above sea level. This plateau, which forms the concession, occupies an area of some 25 sq. miles, and slopes away fairly steeply towards the east and west, forming the divide between two river systems. The plant though found in considerable quantity in the region generally, does not appear to flourish in other places so well as on the plateau.

The plateau is crossed by the main route from Benguella to Lake Tanganyika, and is distant from the port of Benguella some 420 miles by wagon road. The distance across country to the port by bush paths is much shorter and occupies about twenty days, as the wagon road makes a considerable detour to the south in order to cross certain mines. In fine weather the journey by wagon road can be made in about thirty days.

The climate is fairly damp and rain falls during five or six months of the year. The rainy season commences about January; heavy rains are not frequent, but the rains are more like those of England, and there is a considerable amount of damp mist. During

(14163—6a.) Wt. 108—471. 1375. 10/09. D & S.

the dry season no rain ever falls, but mists and heavy dews prevail at night-time. In the wet season the rivers rise about 20 ft. and fall some 2–3 ft. below their normal level in the dry season.

The soil of the plateau is a deep and very sandy loam of finely divided, clean black earth four or more feet in depth. This soil retains moisture readily though it never cakes or runs together; it is always very warm beneath the surface, giving the impression that fermentation is proceeding. It is possible to dig a hole with a stick to a depth of three or four feet as in sand.

The plateau is covered with a very fine grass, growing to a height of not more than 2 ft., and the *Raphionacme* plants are found growing plentifully among the grass. Off the concession (plateau) the growth of the grass is very rank and coarse, some 6 to 7 ft. high, and is almost impossible to penetrate.

The plants grow with the leaves closely pressed to the surface of the ground, forming a kind of rosette after the manner of plantains on a lawn. The tubers usually occur buried just below the surface of the soil, and may be shaped either like a turnip or peg-top, or may be very broadly napiform to discoid. They produce from one to three leafy shoots, each bearing four to six pairs of leaves, and as a rule only one of the shoots produces an inflorescence. The shoots are quite short, but in old plants the inflorescence may be borne on a longer stalk about 2 ins. in length. Unless burnt by bush fires it appears that the leaves remain green, and the tubers continue to grow throughout the year. Of the tubers sent to Kew by Mr. Norman, the discoid ones were the larger, and one of the specimens weighed 2 lbs. 5 ozs. Mr. May, however, states that a large number of the tubers weigh from 4–5 lbs., and that he has found a specimen weighing as much as 15 lbs. It seems probable that there may be more than one species of *Raphionacme* growing on the plateau, but whether the tubers of different shapes belong to different species cannot yet be determined. An inflorescence borne by one of the discoid tubers proves this plant to be *Raphionacme utilis*, though in the general shape and colour of the leaves it differed somewhat from the plant already described (*K.B.*, 1908, p. 215, and *Bot. Mag.* tab. 8221). Mr. May is inclined to believe that there are probably five or six different kinds of rubber-yielding tubers. One kind in particular bears a much larger tuber than the true Ecanda plant, and has finely cut leaves "like a tuft of grass." In this plant the skin or rind of the tuber is coarse like the bark of a tree, and the latex occurs only in the rind. In shape and size the tubers resemble a rugby football. In the Ecanda plants the veins of the leaves may or may not be purple on the underside.

The flowers of *R. utilis* have already been described, but those of Mr. May's plant were of a deep claret colour and borne in a terminal cluster.

The plants usually flower on the plateau in November and early December, the driest time of the year, and the seed is ripened at about the end of December, just before the commencement of the rainy season. Seed is produced in quantity but it tends to be destroyed in great part as the natives burn off the grass among which the plants are growing, just before the rainy season sets in.

The collection of the seed is difficult and to trade costs in goods the equivalent of about £4 per oz.

The tubers are collected by the natives on the plateau in the following manner. The fine grass and general vegetation covering the country is set on fire and the tubers, which can then be easily seen, are hoed up and brought to headquarters in baskets. Large and small tubers are gathered indiscriminately, but the contents of the baskets are weighed and sorted, and only those of large size are kept for the production of the rubber. The two illustrations from photographs, taken by Mr. May on the concession plateau, shew a quantity of the Ecanda tubers brought in by the natives for the extraction of the rubber. The smaller ones are thrown aside, and as they are not materially damaged by the burning of the grass, they are replanted and commence to grow again quite readily.

No attempt at the cultivation or clearing of the ground has been attempted, nor have any experiments been made with the sowing of seed. In replanting the smaller tubers a hole is simply dug in the earth amongst the grass with a native hoe and the tuber is planted and left to grow unattended.

As to the rate of growth of the tubers, it is unfortunate that at present we have no reliable information. According to Professor Geraldes (*K.B.*, 1908, p. 214) the plants are biennial (?), and one-year old plants are stated to be about 3–4 ins. in diameter, and to weigh from 7–10½ ozs. Mr. May has not made any careful observation but is of the opinion, however, that a three-year old root would weigh about 6 ozs. As the natives always burn the long grass once a year in order to obtain fresh herbage, he thinks that these fires may possibly check the growth of any tubers over which they pass. We have been informed that the yield of tubers, on an experimental plantation in a neighbouring region, at a minimum estimate is likely to be 8 tons, and that there is every prospect that a yield of about 12 tons per acre will be realised.

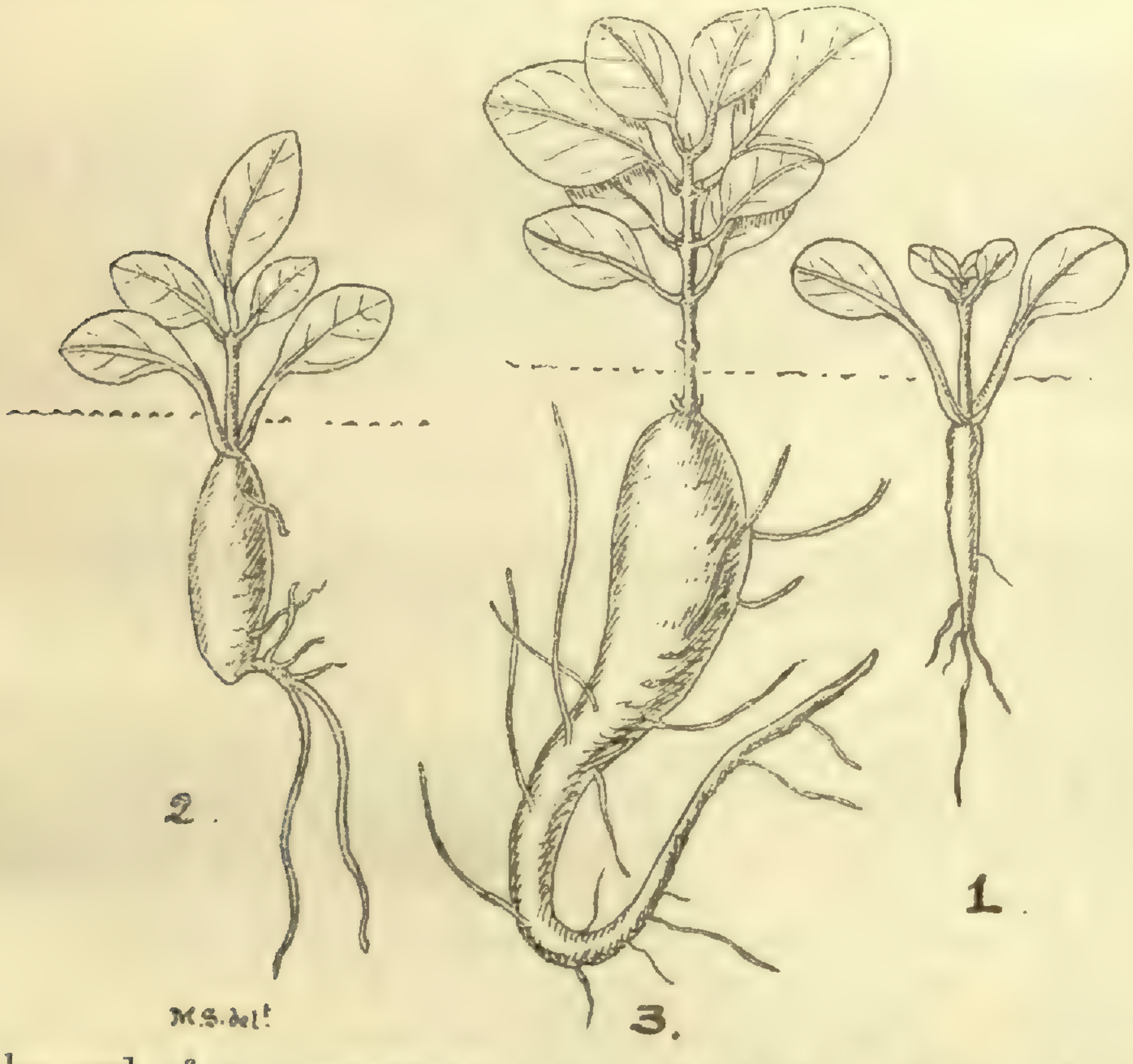
Seedlings of Raphionacme utilis.

In connection with the question of the rate of growth of the Ecanda plant the behaviour of some seedlings raised in the Royal Botanic Gardens, Kew, is of some interest. At the end of December, 1908, a parcel of Ecanda seed was received from the Anglo-Angolese Trading Company, Benguella, 9, Billiter Street, London, E.C., with the following note : "Seeds of the Ecanda tuber, called also 'Vitinga' or 'B'tinga' plant by the Angolese, from the district of M' Bongo, Serra Andrade Corvo, South Angola between 12° 50′ and 14° S. lat. and 14° 40′ and 15° 20 E. long. ; altitude given as between 1,200 and 1,500 m." Some of these seeds were distributed to various suitable Botanic Gardens and some were sown at Kew, on the 2nd January of this year. The seeds germinated quickly and developed two cotyledons with petioles nearly 1 cm. in length ; the laminæ are oblong-obovate obtuse, glabrous and slightly fleshy.

The plumule usually develops with an elongated first internode, about 1 cm. in length, the subsequent internodes being short. The internodes are delicately hairy with short glandular hairs. The

plumular leaves, which shew a decussate arrangement, are more or less ovate, glandular, and have a well-marked mid rib. In the course of two months the young shoot has reached the stage shewn in Fig. 1, and at the end of seven months the seedlings have grown to the size shewn in Figs. 2 and 3.

The development of the tubers below ground proceeds somewhat slowly as shewn in the figures :—



At the end of two months the tap root had swollen to form an elongated fusiform tuber 1 cm. long by about 2 mm. in diameter, and during this time it is pulled deeper into the soil by the action of root shortening. The tuberous root in the largest example, Fig. 3, is some 4–5 cm. in length and 9 mm. in diameter.

Some seeds were also received at Kew from the Botanic Gardens, Dahlem, Berlin, under the name of *Nitinga rosea* in August, 1908, which germinated, and it is now possible to recognize that the young plants are probably seedlings of *Raphionacme utilis*, the name *Nitinga* being apparently a corruption of the native name B'tinga or Vitinga.

These latter plants, now a year old, have a single shoot which has grown continuously and is about 3 cm. long with five pairs of leaves crowded towards the shoot apex. The tuber which is becoming more globular measures 1·5 cm. in diameter. Although Mr. May is of the opinion that the Ecanda plants grow more quickly in Angola than they do at Kew it appears clear that the *Raphionacme* is not a biennial plant as was at first suggested.

In the Bulletin of the Imperial Institute, vol. vi., 1908, pp. 390–393, a short account of the analysis of the tubers of the *Bitinga* rubber plant is given, derived from specimens received from the Mozambique Company.

Explanation of Plate.

1. Natives trading tubers of *Raphionacme* at Mr. May's permanent camp.

2. A load of tubers spread out to dry in the sun after the wagons had crossed a river.

XLV.—DIAGNOSES AFRICANAE: XXXI.

1041. **Cephalonema**, *K. Schum. in Schlechter, Westafr. Kautschuk—Exped.* 299 ; *De Wild. in Ann. Mus. Congo*, sér. 5, i. 53, 164 ; ii. 46, 298 ; *Miss. É. Laurent*, i. 151 ; nomen ; De Wild. Not. Pl. Util. Congo, 29 ; gen. nov. [Tiliaceae—Tilieae]; affinis *Honckenyae*, Willd., a qua staminibus numerosissimis, stigmatibus subulatis et fructu alato differt ; descriptio (auct. *T. A. Sprague*).

Inflorescentia ut in *Honckenya*. *Flores* quoad calycem et corollam tetrameri. *Sepala* extus infra apicem corniculata. *Petala* lutea. *Staminodia* numerosissima, extra stamina inserta. *Stamina* numerosissima, interiora exterioribus sesquilongiora. *Ovarium* oblongum, acute angulatum, 5–6–loculare ; stigmata subulata, anthesi haud reflexa ; ovula pro loculo numerosa, biseriata. *Capsula* oblonga, 5–6–alata, 5–6–locularis, alis rigide setoso-ciliatis, ceterum non setosa.

Cephalonema polyandrum, *K. Schum. l.c. ; De Wild. ll. cc. ;* nomen (species unica).

Folia late ovata, indivisa, vel angulato-suborbicularia, interdum leviter triloba, basi cordata, apice longe acuminata, 9–14 cm. longa, 6–10 cm. lata, subdupliciter serrata, supra exsiccando brunnea, sparse stellato-puberula praecipue in nervis, subtus pallidiora, in nervis stellato-pubescentia ceterum puberula, basi 7–nervia, nervis supra obviis subtus conspicuis, tertiariis regulariter parallelis plerumque 2–4 mm. distantibus ; petioli 3–7 cm. longi ; stipulae subulatae, obtusae, circiter 6 mm. longae, ferrugineo-pubescentes. *Sepala* spathulato-linearia, 2 cm. longa, superne 3 mm. lata, 3 mm. supra basin leviter constricta 1·5 mm. lata, extra minute puberula, cornu subapicali 0·7 mm. longo. *Petala* oblanceolata, 1·8 cm. longa, 5–6 mm. lata, ciliolata. *Staminodia* ultra 100, usque ad 9 mm. longa ; antherae rudimentariae 0·3–0·4 mm. longae. *Stamina* circiter 80, exteriora 1·1 cm. longa, interiora 1·6 cm. longa ; antherae staminum breviorum 0·7 mm. longae, longiorum fere 1 mm. longae. *Ovarium* circiter 2 mm. longum, pentagonum vel hexagonum, pubescens, cito post anthesin setosum, loculis angulis oppositis ; stylus circiter 5 mm. longus ; stigmata 5–6, leviter divergentia. *Capsula* 3·5–4 cm. longa, alis 3–5 mm. latis, setis rigidis sparse minute puberulis 2–4 mm. longis ; septa post dehiscentiam fibroso-ciliata, fibris ascendentibus. *Semina* plano-convexa, ambitu late obovata, ultra 2 mm. longa, fere 2 mm. lata, facie convexa leviter tuberculata.

Cameroons. Yaunde, *Zenker*, 1488. Congo Free State. Between Kisantu and Popocabaka, *Gillet*, 2298 ; near Kimuenza, *Gillet*, 1683 ; valley of the Djuma River, *Gillet*, 2734 ; *Gentil ;* in

thickets and at the edges of woods near Coquilhatville, *Schlechter*, 12594; at Eala, *Marc Laurent*; Equateur District, *Pynaert*; Lulonga, *Pynaert*, 764; *É. Laurent*; Romée, *É. Laurent*. Spanish Gaboon (?), *Tessmann*, 475.

According to De Wildeman, *C. polyandrum* is known under the following native names in the Congo Free State: "Punga," "Lotiti," "Dolukonge," "Bekonge," "Lokonge." A rather silky fibre is extracted from it by the natives. At Eala, the native name "Dolokonge" is applied to *Honckenya ficifolia*, which also yields a fibre.

Cephalonema is closely allied to *Honckenya*, the chief differences being as follows:—

Honckenya. Leaves not acuminate, tertiary nerves irregular. Petals purplish. Stamens 16 or fewer. Stigmas linear, obtuse. Capsule not winged, bristly all over.

Cephalonema. Leaves acuminate, tertiary nerves regular, parallel. Petals yellow. Stamens very numerous. Stigmas subulate. Capsule winged, the wings fringed with bristles, elsewhere not bristly.

1042. Ceropegia Brownii, *Ledger* [Asclepiadaceae]; affinis *C. mozambicensi*, Schltr., sed floribus multo majoribus lobis erecto-conniventibus valde diversa.

Caulis volubilis, glaber. *Folia* patentia, vix vel tenuiter carnosa, glabra; petiolus 0·5–1 cm. longus; lamina 2–5·5 cm. longa, 1–2·5 cm. lata, lanceolata vel ovata, acuta vel acuminata, basi acute cuneata, margine obscure ciliato-dentata. *Pedunculi* ad nodos laterales, 1–1·3 cm. longi, glabri, 1–2 flori. *Bracteae* minutae. *Pedicelli* 5–6 mm. longi, glabri. *Sepala* 4 mm. longa, e basi attenuata, acuta, glabra. *Corollae* tubus 4–4·2 cm. longus, basi inflatus, parte inflata 1–5 cm. longa 7 mm. diam. supra medium constricta, superne cylindricus et 3 mm. diam., apice abrupte dilatatus, late infundibuliformis et 1·5 cm. diam., extra glaber, pallide virens, ad apicem albido-virens, fusco-maculatus, intra superne glaber, inferne (inflata parte superiore excepta) albo-pilosus, pallide virens, basi supra constrictionem purpureo-maculatus, infra constrictionem fusco-virens striatus; lobi erecto-conniventes, 1·5 cm. longi, basi (explanati) deltoidei, superne lineares, arcte replicati, laete-virentes, ad medium zona alba cum zona atropurpurea superposita ornati, intra (apice excepto) pilis atropurpureis longis pilosi, ad apicem tantum pilis longissimis tremulis subclavatis purpureis ciliati. *Corona exterior* 1 mm. longa, columna staminum duplo brevior, 5-saccata, truncata, glabra, extra alba, maculo semicirculari atrato notata, intra atropurpurea. *Coronae interioris* lobi 3·3 mm. longi, basi antheris arcte incumbentes, superne erecti, subclavati, plus minusve connati, albi, basi atropurpureo-marginati, glabri.

Uganda. Mabira Forest, *Brown*.

Described from a living plant sent by Mr. Ernest Brown (after whom it is named) to Mr. W. Ledger, of Wimbledon. It is nearly related to *C. mozambicensis*, Schltr., having a similar double inflation at the base of the corolla-tube, but has much larger flowers, with connivent-erect (not incurved-connivent) corolla-lobes and other differences.

1043. Ceropegia dentata, *N. E. Brown* [Asclepiadaceae]; species affinis *C. convolvuloidei*, A. Rich., sed foliis dentatis, cymis subsessilibus et corolla extra glabra distinctissima.

Caulis volubilis, gracilis, puberulus. *Folia* herbacea, longe petiolata, utrinque parce et minute pubescentia; petiolus 2–3 cm. longus; lamina 4–5 cm. longa, 3·5–4·5 cm. lata, late cordato-ovata, grosse et acute dentata, apice abrupte et longe acuminata, lobis basalibus late rotundatis. *Cymae* ad nodos laterales, subsessiles, 5–7-florae. *Bracteae* minutae. *Pedicelli* 7–10 mm. longi, graciles, glabri. *Sepala* 2·5 mm. longa, e basi attenuata, glabra. *Corollae* tubus 1·1–1·2 cm. longus, basi globoso-inflatus et 8 mm. diam., superne cylindricus et 2·5 mm. diam., apice haud ampliatus, sed loborum basibus desuper productis et projectis, extra glaber, albus, basi atropurpureus; lobi 8 mm. longi, erecti, apice connati, e basi deltoidei anguste spathulati, replicati, intra leviter carinati, albidi, basi purpureo-atrati, extra glabri, intra marginibus et carinis pilis albis ciliati. *Corona exterior* 5-loba, glabra, atropurpurea; lobi bifidi, basi breviter transverse oblongi, dentibus 1·5 mm. longis linearisubulatis valde divergentibus. *Coronae interioris* lobi 2·5 mm. longi, subulato-filiformes, inferne conniventes, superne recurvi, glabri, ut videtur atropurpurei.

Portuguese East Africa. Mozambique; Macome, Madanda, 65 m., *W. H. Johnson*, 100.

According to Mr. Johnson the flowers are very charming, white, with purplish-black markings.

1044. Ceropegia hastata, *N. E. Brown* [Asclepiadaceae]; affinis *C. Caffrorum*, Schltr., sed caule graciliore, foliis hastatis et corolla minore differt.

Caulis volubilis, gracilis, 1·5 mm. crassus, basi interdum nodoso-tuberosus, glaber. *Folia* patula, carnosa, glabra; petiolus 2·5–4·5 mm. longus; lamina 1·4–2 cm. longa, basi 6–12 mm. lata, hastato-lineari-oblonga vel hastato-ovata, acuta, lobis vel auriculis basalibus rotundatis vel angulatis. *Pedunculi* ad nodos laterales, 6–8 mm. longi, 1–2-flori, glabri. *Bracteae* minutae. *Pedicelli* 5 mm. longi, glabri. *Sepala* 3 mm. longa, lanceolata, acuta. *Corollae* tubus 1·3 cm. longus, basi globoso-inflatus et 4·5 mm. diam., superne angustior, cylindricus, apice levissime ampliatus, 3·5–4 mm. diam., extra glaber, intra tenuiter pilosus, pallidus; lobi erecto-conniventes, apice connati, 5·5–6 mm. longi, basi deltoidei, medio constricti, apice spathulato-ovati, replicati, intra carinati, extra glabri, intra pilis longis atropurpureis deflexis pilosi, atropurpureo-venosi. *Corona exterior* lobulis 5 deltoideis obtusis erectis coronae interioris lobis oppositis et eis basi adnatis cum sinubus 5 truncatis alternantibus, glabra, albida (?), basi intra atropurpureo maculata. *Coronae interioris* lobi 2 mm. longi, erecto-conniventes, apice leviter recurvi, anguste lanceolati, acuti, glabri, albi (?).

Cape Colony. Uitenhage Division; near Bethelsdorp, *Mrs. T. V. Paterson*, 656.

Described from a specimen preserved in formalin, forwarded to Kew by Dr. Schönland. Its position in the series of South African species is between *C. Caffrorum*, Schltr. and *C. assimilis*, N.E.Br.

1045. Caralluma sacculata, *N. E. Brown* [Asclepiadaceae]; affinis *C. Sprengeri*, N.E.Br., sed corolla tubo campanulato lobis longiore et corona exteriore 5-sacculata facile distinguitur.

Caules erecti vel basi decumbentes, 5–8 cm. alti, absque dentibus ultra 1 cm. crassi, 4-angulati, glabri; anguli dentibus 8–11 mm. longis subulatis acutissimis persistentibus muniti. *Flores* in fasciculum 3–4-ni aggregati, prope apicem ramorum dispositi. *Pedunculi* erecti, 6–8 mm longi glabri. *Sepala* 6 mm. longa, lanceolata, acuminata, glabra. *Corolla* tubuloso-campanulata; tubus siccatus, 8–10 mm. longus, basi 6–8 mm. diam., superne angustatus, utrinque glaber, virescens ut videtur; lobi patentes, 5 mm. longi, 3 mm. lati, deltoideo-ovati, marginibus revolutis, extra glabri, intra minutissime puberuli, atropurpurei. *Corona exterior* 5-sacculata, 3·5 mm. longa, 5 mm. diam., columnae staminum aequilonga, glabra, sacculis apice breviter bifidis. *Coronae interioris* lobi 1·75 mm. longi, lineares, obtusi, glabri, antheris incumbentes, apicibus erectis, basi cum corona exteriore connexi.

Southern Abyssinia, *Drake-Brockman*, 129.

1046. Faurea decipiens, *C. H. Wright* [Proteaceae-Proteeae]; species *F. speciosae*, Welw., affinis, perianthio extus pubescente differt.

Arbor parva. *Rami* primum pubescentes. *Folia* ovato-lanceolata vel elliptica, 17 cm. longa, 5–7 cm. lata, supra glabra, nitida, subtus laxe pubescentia, marginibus recurvis; nervi laterales plures, tenues, utrinque conspicui, intra marginem arcuatim connexi; petioli 12 mm. longi, plano-convexi, pubescentes. *Spicae* ad apicem ramorum singulatim vel fasiculatim dispositae, 23 cm. longae, densiflorae; bracteae minutae, deltoideae, acutae, tomentosae. *Perianthium* tenue, 16 mm. longum, extus pubescens; tubus 1 mm. diam. ante anthesin; lobi oblongi, acuti. *Squamae* hypogynae breviter triangulares, acutae, interdum bifidae. *Antherae* lineares, obtusae, mucronatae. *Ovarium* ovoideum, pilis longis vestitum; stylus quam perianthium paullo brevior.

British Central Africa. Nyasaland: Shire Highlands, *Adamson*, 75; *Buchanan*, 1; Tshimenuze, 1,070 m., *Kirk*.

1047. Protea Elliottii, *C. H. Wright* [Proteaceae-Proteeae]; species *P. angolensi*, Welw., affinis, perianthii tubo villoso differt.

Frutex. *Rami* juveniles albo-pilosi, demum glabrescentes. *Folia* late ovata, obtusa, basi cuneata et subpetiolata, 14 cm. longa, 7 cm. lata, primum pilosa, coriacea, pallide viridia; nervi laterales ascendentes, utrinque prominentes; nervi marginales crassi. *Capitula* terminalia, globosa, 11 cm. diam.; bracteae extus appresse sericeae, exteriores late ovatae, interiores oblanceolatae, obtusae, 5 cm. longae, 10 mm. latae. *Perianthium* 4·5 cm. longum, dense villosum, basi pilis fasciculatis 8 mm. longis instructum: labium anticum naviculare, posticum angustum. *Antherae* lineares, 7 mm. longae; connectivum apice subulatum. *Stylus* perianthio paullo longior; stigma parvum.

Northern Nigeria. Zungeru, *Elliott*, 2; *Dalziel*, 69.

1048. Protea Kirkii, *C. H. Wright* [Proteaceae-Proteeae]; species *P. abyssinicae*, Willd., affinis, nervis lateralibus foliorum patentibus differt.

Rami lignosi, teretes, primum dense ferrugineo-pubescentes, demum glabri. *Folia* e basi lata sessilia, oblonga, apice rotundata,

10 cm. longa, 2·5 cm. lata, glabra; nervi laterales conspicui, patentes, utrinque prominentes, marginales crassi. *Capitula* ad ramos terminalia, sessilia, 6·5 cm. diam.; bracteae extus tomentosae, dense ciliatae, exteriores ovatae, 6 mm longae, interiores oblanceolatae, 4 cm. longae, 6 mm. latae. *Perianthium* 4 cm. longum, dense ferrugineo-pilosum, pili basilares 8 mm. longi. *Antherae* lineares, 6 mm. longae, apice mucrone brevi subulato instructae. *Styli* 4·5 cm. longi, triangulares.

Portuguese East Africa. Moramballa Mountain, 910 m. *Kirk.*

1049. Protea trichanthera, *Baker* [Proteaceae-Proteeae]; species *P. madiensis*, Oliv., affinis, nervis lateralibus foliorum patentibus differt.

Frutex. Rami pubescentes. *Folia* brevissime petiolata, oblonga, 13–15 cm. longa, 6–7·5 cm. lata, obtusa, basi deltoidea vel rotundata, rigide coriacea, supra viridia glabraque, subtus pallidiora denseque pubescentia; nervi laterales tenues, utrinque prominentes, intra marginem arcuatim connexi. *Capitula* globosa, 8 cm. diam.; bracteae extus sericeae, apice demum glabrae, exteriores breves, late ovatae vel suborbiculares, intimae oblongae vel oblanceolatae. *Perianthium* 5 cm. longum, parte inferiore glabrum, parte superiore densissime villosum; lobi acuti. *Antherae* lineares, 1·5 cm. longae, obtuse mucronatae. *Ovarium* ovoideum, pilis ferrugineis 1·5 cm. longis vestitum; stylus apice attenuatus.

British Central Africa. Nyasaland: Tanganyika Plateau; Fort Hill, 1070–1223 m., *Whyte.*

1050. Monadenium invenustum, *N. E. Brown* [Euphorbiaceae]; affinis *M. Goetzei*, Pax, sed foliis multo brevioribus orbiculare-ovatis vel subrhomboideo-ovatis marginibus crenulatis vel crispulis differt.

Caulis 15–35 cm. (vel ultra ?) altus, glaber. *Folia* utrinque pilis minutissimis adspersa; petiolus 4–5 mm. longus; lamina 1·2–3 cm. longa, 1·2–2·5 lata, orbiculari-ovata vel subrhomboideo-ovata, apice acuta, basi cuneata vel subrotundata, marginibus crenulatis vel crispulis. *Cymae* axillares, nutantes, 1·2 cm. longae, involucros 3 gerentes. *Pedunculi* 4–5 mm. longi, recurvi. *Bracteae* in cupulam 6 mm. longam, obliquam, antice apertam, apice breviter bifidam dorso bicarinatam connatae, microscopice puberulae. *Involucrum* 4–5 mm. longum, truncatum, antice ad medium apertum. *Ovarium* microscopice puberulum, angulis crispulis.

British East Africa. Kibwezi, *Kässner*, 717; Simba *Kässner*, 729.

XLVI.—CORNUS MACROPHYLLA, AND SOME ASIATIC CONGENERS.

W. Botting Hemsley.

In connection with the figuring of *Cornus macrophylla*, Wall., for the Botanical Magazine, Mr. Bean called attention to the fact that the species cultivated under this name at Kew and elsewhere in the United Kingdom is different from the one known as

such on the Continent, which is the same as the one known here under the name of *brachypoda*. A comparison of the Kew *C. macrophylla* with the original type specimens confirmed the correctness of the name adopted. Against this it was found that the Kew *brachypoda* was incorrectly named. Briefly stated, two species, or, according to the views of some botanists, three species are concerned in this confusion. In the following classification, the forms in question are placed under two species, one having opposite leaves, the other alternate. How or where the error originated is unimportant, but Dr. E. Koehne is responsible for describing *C. macrophylla*, in the place cited below, as having alternate leaves, and also for describing the genuine *C. macrophylla* under the new name of *C. corynostylis*. Thus, the species having alternate leaves is without a name, and for this species the name *controversa* is here proposed. It is only fair to repeat here that the late Mr. C. B. Clarke, in the Flora of British India, included specimens having alternate leaves under *C. macrophylla*, Wall., and this may have led Dr. Koehne, and others, to the conclusion that this name belonged properly to the species having alternate leaves. In the synonymy below of *C. macrophylla* and *C. controversa* it has not been considered necessary to include references to every place in which incorrect names are on record. Incidentally it may be added that the flowers of *Cornus* offer no striking modifications, and the species are based largely on vegetative characters.

Cornus macrophylla, Wall. in Roxb. Fl. Ind., Carey & Wallich edition, 1820, vol. i., p. 433; Wall. Cat. 469; C. B. Clarke in Hook. f. Fl. Brit. Ind., vol. ii, p. 744, excl. exempl. foliis alternis et var. *Stracheyi*; Collett, Fl. Siml., p. 219; Brandis, For. Fl., p. 252, t. 32; Hemsl. in Journ. Linn. Soc. Bot., vol. xxiii., p. 345, excl. *Cornus sp. affinis C. alternifoliae*, S. Moore, et exempl. ex Amoy, Fortune, 2; J. H. Veitch in Journ. R. Hort. Soc., 1902–3, vol. xxvii., p. 861, cum habitus figura; Hemsl. in Bot. Mag. t. 8261. *C. brachypoda*, C. A. Mey. in Mém. Acad. St. Petersb., vol. vii. (1845), p. 223; Rehder in Sargent Trees and Shrubs, vol. i., p. 81, t. 41; Koehne in Gartenfl., vol. xlvi., p. 94. *C. sanguinea* et *C. alba*, Thunb. Fl. Jap., pp. 62, 63, non Linn., et *C. glauca*, Blume ms. *C. Thelicanis*, Lebas in Rev. Hort. 1875, p. 394, f. 64. *C. Theleryana* et *C. Religiana*, Hort. *C. crispula*, Hance in Journ. Bot., 1881, vol. xix., p. 216. *C. ignorata*, Shirasawa, Ic. Ess. For. Jap., vol. i., p. 121, t. 77, ff. 1–12. *C. corynostylis*, Koehne in Gartenfl., 1896, vol. xlv., p. 286, f. 51, et Mitt. der Deutschen Dendrol. Gesellsch. 1903, pp. 33, 36, 44.

C. macrophylla, Wall., as here limited, ranges from the North-west Himalayas to China and Japan, though it does not appear to have been collected in the Eastern Himalayas. Throughout this wide range there is the same kind and extent of variation as in *C. controversa*, described in the account of that species below; but there are equally highly developed conditions of *C. macrophylla* from Kumaon, Hupeh, Ningpo, and Nagasaki, all having leaves, 15–20 cm. long on the flowering branches, glaucous beneath, and all having large inflorescences. Specimens in the Kew Herbarium, received from Leyden in 1865 and 1867, and labelled *Cornus brachypoda*, C. A. M., Japonia, may perhaps be accepted as

correct. They are undistinguishable from cultivated specimens named *C. Theleryana*, and characterised by having smaller leaves, pale but not decidedly glaucous on the under surface, and by the calyx-teeth being larger than in typical *C. macrophylla* from Kumaon, and as figured in the Botanical Magazine, t. 8261. *C. glauca*, Blume (ined.?), received by Bentham from Leyden in 1853, is the same, as well as a specimen from Zuccarini's herbarium labelled *Cornus* (*sanguinea*, Thb.), Legit in Japonia de Siebold. Communicavit Zuccarini, anno 1843; the last sentence in Bentham's handwriting.

There are other specimens, both wild and cultivated, more or less intermediate in dimensions and other characters, so that it is impossible to sort them into two groups. For example, cultivated specimens received from Mr. B. E. C. Chambers, of Haslemere, in 1900, have leaves about 10 cm. long, pale on the under surface, except the brown nerves, and are neither typical *C. macrophylla*, Wall., nor typical *C. brachypoda*, C. A. M. It is of importance and great interest to know whether there have been importations both from India and the far east.

India: Murree, *Thomson*, *Bellew*; Hazara, *Stewart*; Kashmir, *Clarke*, *Edgeworth*; Simla, *Lady Dalhousie*, *Collett*; Garhwal, *Jameson*; Kumaon, *Wallich*, 469, *Strachey & Winterbottom*, *Thomson*, *Madden*.

China: Szechuen, Mt. Omi, *E. H. Wilson*, 4951A, 4952; Hupeh, various localities, *A. Henry*, 725, 5506, 6266, 7434; *E. H. Wilson*, 1152, 1935, 1935A, 2268; Ningpo mountains, *Faber*, 77.

Japan: Yokohama and Nagasaki, *Maximowicz*; Nagasaki, *Oldham*, 467; without locality, *Siebold*.

The *Cornus scabrida*, Franch. in Nouv. Arch. Mus. Hist. Nat. Par., sér. 2, vol. viii., p. 250, is of this affinity, but I have seen no authenticated specimen.

Cornus ulotricha, C. K. Schn. et Wang. in Fedde Repert. 1909; Schneider, Handb. der Laubholzk. vol. ii., p. 445.

China: Hupeh; without exact localities, *E. H. Wilson*, 984, 2174, 2341.

This differs from *C. macrophylla*, Wall., in the curled hairs on the under surface, especially of the leaves, and in the disk and style being hairy. Whether intermediate conditions exist is uncertain.

Cornus controversa, *Hemsl.*, species hucusque cum *C. macrophylla*, Wall. (*C. brachypoda*, C. A. Mey.) ab auctoribus nonnullis confusa, a qua differt tamen imprimis foliis alternis longe graciliterque petiolatis.—*Corni species* 2 alternifoliae gerontogeae nondum (ut apparet) descriptae, S. Moore in Journ. Bot. 1877, vol. xv., p. 292. *C. macrophylla*, Koehne in Gartenfl., 1896, vol. xlv., p. 285, cum drupae figura; Shirasawa, Ic. Pl. Jap., vol. i., t. 77, ff. 13–23, non Wall. *C. brachypoda*, Hort., praecipue anglic., non C. A. Mey.; Koehne, Dendrol. 1893, p. 435. *C. macrophylla*, C. B. Clarke in Hook. f. Fl. Brit. Ind., vol. ii., p. 744, quoad exempl. foliis alternis.

So far as I know only one other species of *Cornus* with alternate leaves has been described, namely, *C. alternifolia*, Linn. f., a North American shrub or small tree, bearing smaller leaves, sparsely

clothed on the lower surface with simple hairs and relatively small cymes of flowers. Koehne seems to have been the first to publish a description of the Asiatic species having alternate leaves, though unfortunately under a wrong name ; but Mr. Spencer Moore, when naming Bisset's Japanese plants upwards of thirty years ago, marked some of the specimens in the Kew Herbarium as "species nova," and published a note on the same in the place cited above. His note runs as follows :—" Vidi in Herb. Kew. *Corni* species 2 alternifoliae gerontogeae nondum (ut apparet) descriptae. Harum altera in regione Sinensi a Fortune et Japonia a Maingay necnon nuper a cl. Bisset referta, ab altera Sikkimensi et Bhotanensi praecipue calyce urceolato (haud campanulato) differt. Ambae C. alternifoliae, Linn. f. sunt affines, sed cymis laxis facile distinguendae. Vidi etiam C. brachypodae, C. A. Mey. (C. macrophyllae, Wall. ?) specimen ex Herb. Lugd. Bat. comm., in quo fortasse sint folia interdum alterna. Exsistit autem hoc loco quaedam quaestio difficilis ; num haec species sint vere semper alternifoliae."

I have extracted this note in full, because with much additional material under observation I am unable to distinguish two species, and Dr. Koehne also combines the Indian and Chinese specimens under one name.

C. controversa, Hemsl., has nearly as wide a range as *C. macrophylla*, Wall., but it has hitherto not been found in the Western Himalaya. Specimens from different localities, and especially those from the open as compared with those from shade are very dissimilar in aspect, yet I think that all those enumerated below may be classed as one and the same species. In its most highly developed condition, as represented by Wilson's specimens from Hupeh and Szechuen, 233 and 4,951, it is perhaps the most ornamental species of the genus. Briefly described this state is :—

Arbor 9–12 m. alta, ramis florigeris graciliusculis glabrescentibus rubescentibus vel nigrescentibus. *Folia* alterna, longe petiolata ; lamina ovata, elliptica vel orbicularia, 10–15 cm. longa, acuminata, acuta, basi rotundata vel subcuneata, supra cito glabrescentia, viridia, nitida, infra glauca, pilis obscuris medio affixis arctissime appressis instructa, nervis primariis utrinque saepius 6–8 sat conconspicuis arcuatis ; petiolus gracilis, 3–7 cm. longus. *Cymae* terminales, percompositae, laxae, maximae usque ad 18 cm. diametro, breviter stipitatae, ramis pedicellisque puberulis. *Flores* albi, numerosi, circiter 10–12 mm. diametro. *Calycis tubus* ecostatus, pilis argenteis densissime vestitus. *Petala* anguste oblonga, subobtusa. *Stamina* petala excedentia. *Stylus* cylindricus, glaber, quam petala dimidio brevior. *Drupa* globosa, 6–8 mm. diametro, pilis paucis argenteis medio affixis conspersa, apice excavata.

As here understood *C. controversa*, Hemsl., includes the specimens as cited :—

India : Sikkim, *Hooker*, 4 ; *C. B. Clarke*, 27747 ; Bhotan, *Griffith*, 893 and 3392, Kew Distribution ; Manipur, *G. Watt*, 6850.

China : Yunnan ; Red River valley, near Manpan, at 600 m., *A. Henry*, 10747A ; Fengchenlin, at 1,800 m., *A. Henry*, 10747B ;

Szechuen, *A. Henry*, 8970; Mount Omi, *Faber*, 156; same locality, *E. H. Wilson*, 233, 4951.

COREA: Seoul, *Sontag*.

JAPAN: Various localities, *Bisset*, *Buerger*, *Elwes*, *Maingay*, *Maries*, *Maximowicz*, *Siebold*, *Takeda*.

The investigations connected with *C. macrophylla*, and *C. controversa* brought to light several apparently new species, descriptions of which follow.

Cornus Stracheyi, *Hemsl.*, species cum *C. macrophylla*, Wall., adhuc confusa, a qua tamen bene distincta, imprimis inflorescentiae ramis ferrugineo-pubescentibus, calycis tubo ecostato et dentibus conspicuis.

Rami floriferi validi, striati, glabrescentes, ut videtur atropurpurei. *Folia* semper opposita, petiolata; lamina tenuis, ovata vel ovato-lanceolata, 10–20 cm. longa, acute acuminata, basi rotundata, nervis primariis lateralibus utrinque circiter 8 supra impressis subtus elevatis; petiolus 2–4 cm. longus. *Cymae* terminales, erectae, breviter stipitatae, foliis breviores, circiter 10 cm. diametro, densae, multiflorae, fere planae, ferrugineo-pubescentes, ramis crassiusculis; pedicelli brevissimi. *Flores* expansi non visi; alabastra bene evoluta circiter 5 mm. longa, acuta. *Calyx* ecostatus, pilis simplicibus et biradiatis intermixtis vestitus; dentes lineares, 1–1·5 mm. longi. *Drupa* globosa, 4–5 mm. diametro.—*C. macrophylla* var. *Stracheyi*, C. B. Clarke in Hook. f. Fl. Brit. Ind., vol. ii., p. 744.

INDIA: Kathi, Kumaon, at 2,250 m., *Strachey* and *Winterbottom*; *T. Thomson*, 715.

Cornus Mombeigii, *Hemsl.*; inter species sinenses ob folia rotundato-cordata pilis longis biramosis crispulis mollibus praecipue subtus dense vestita insignis.

Rami ultimi cymas ferentes crassiusculi, cito glabrescentes, purpurascentes, lenticellis parvis instructi. *Gemmae* elongatae, teretes, angustae, circiter 1 cm. longae. *Folia* opposita, petiolata; lamina orbiculari-cordata, 4–9 cm. diametro, acuminata, acuta, basi cordata vel interdum fere rotundata, subtus inter nervos albido-tomentosa, nervis ferrugineis, supra viridia, puberula, nervis primariis utrinque 7–9 arcuatis sat conspicuis; petiolus 1·25–2 cm. longus. *Cymae* terminales, breviter stipitatae, folia vix excedentes, 7–10 cm. diametro, densae, multiflorae, ramis pedicellisque crassis ferrugineo-villosulis. *Flores* circiter 12 mm. diametro. *Calyx* ut petala extra villosulus, dentibus fere filiformibus circiter 0·5 mm. longis. *Petala* ovato-oblonga, obtusiuscula. *Stamina* petala superantia. *Discus* carnosus, prominens. *Stylus* petalis brevior, cylindricus. *Drupa* non visa.

CHINA: Yunnan; Tsekou, *Père Mombeig*.

Cornus poliophylla, *C. K. Schn. et Wang.*, in Fedde Repert. 1909; Schneider, Handb. der Laubholzk. vol. ii. p. 447.

CHINA: Hupeh; Fang, *E. H. Wilson*, 2167, 2341.

This is allied to *C. Mombeigii*, Hemsl., differing in the much slenderer inflorescence and denser tomentum of the foliage and other characters. Some of the leaves of Wilson's 2341 are indeed very like those of the species in question.

Cornus Hemsleyi, *C. K. Schn. et Wang.*, in Fedde Repert. 1909; Schneider, Handb. der Laubholzk. vol. ii., p. 446.

CHINA: Hupeh, *E. H. Wilson*, 1385.

In consequence of the fruiting and flowering specimens of *C. Hemsleyi* and *C. poliophylla*, having been intermixed in the distribution of the specimens collected by Wilson, some difficult points arose, which the discovery of the mistake has cleared up. *C. Hemsleyi* has closely appressed hairs on the underside of the leaf, whilst in *C. poliophylla* the hairs are curled and projecting.

Cornus Wilsoniana, *Wang.*, in Fedde Repert. vol. vi. (1908), p. 97; Schneider, Handb. der Laubholzk. ii., p. 444. *C. Walteri*, Wang., in Fedde Repert. vi. (1900), p. 99.

CHINA: Hupeh; Nanto and mountains to the northward, *A. Henry*, 3891, 4555; without exact locality, *E. H. Wilson*, 764.

With copious specimens before me, I have no hesitation in reducing Dr. Wangerin's *C. Walteri*, and Dr. Schneider agrees with me, I believe, on this point.

Cornus Fordii, *Hemsl.*, species *C. Wilsonianae*, Wang., similis sed foliis crassioribus late ovatis vel ellipticis obtusis, nervis primariis utrinque 3 vel 4 tantum et cymis parvis foliis brevioribus differt.

Arbor 5–10 m. alta, novellis, praecipue foliis floribusque, pilis argenteis arctissime appressis medio affixis instructis. Rami fructigeri graciles, internodiis quam foliis multo brevioribus. *Folia* opposita, petiolata, cinerea; lamina subcoriacea, ovato-elliptica, rarius lanceolato-oblonga, 5–12 cm. longa, obtusa, utrinque attenuata vel basi subrotundata, margine obscure crenulato-sinuolata, nervis primariis utrinque saepius 4 tenuibus supra inconspicius subtus elevatis; petiolus gracilis, 1–2 cm. longus. *Flores* non visi. *Cymae* fructigerae axillares vel terminales, subtrichotomae, 5–10 cm. diametro, laxiusculae, foliis breviores, ramis pedicellisque gracilibus. *Drupa* globosa, circiter 7 mm. diametro.

CHINA: Kwangtung; without locality, *C. Ford*, 297 and 300, 1887; Hupeh; Changyang, *A. Henry*, 7751.

Cornus paucinervis, *Hance* in Journ. Bot. 1881, p. 216: Hemsl. in Journ. Linn. Soc., vol. xxiii., p. 346.

This is one of the species having well-developed calyx-teeth, and an authenticated specimen of *C. quinquenervia*, Franch. in Journ. de Bot. 1896, p. 307, leaves no doubt of its being conspecific.

In addition to those enumerated in the Linnean Society's Journal, the following specimens are of this species, namely: A. Henry, 10800 and 10800A, typical; and A. Henry, 1683A; E. Faber, 282 and 637, var. foliis latioribus nervis minus conspicuis. E. H, Wilson's, 495 from Western Hupeh, and his 4950 from Mount Omi. also belong here.

Cornus oblonga, *Wall.* in Roxb. Fl. Ind., ed. Carey & Wall., vol. i., p. 432; Fl. Brit. Ind., vol. ii., p. 744.

The Chinese specimens bearing the following numbers belong to this species: Yunnan, Delavay, 4609; A. Henry, 9930, 11161; G. Forrest, 382; E. H. Wilson, 2241.

Cornus Bretschneideri, *L. Henry* in Le Jardin, 1899, vol. xiii., p. 309, ff. 154, 155.

Kew possesses living plants bearing this name, but no authenticated specimens. Mr. Bean states that it is of bushy habit, throwing up annually new shoots from the base. Dr. A. Henry's 6696, from Fang, Hupeh, must be very near this species if not the same. It is closely allied to *C. alba*, L., and characterised by having pedicels considerably longer than the ovary.

Cornus chinensis, *Wang.*, in Fedde, Repert., vol. vi., p. 100.

This is closely allied to *C. Mas*, Linn. and *C. officinalis*, Sieb. et Zucc. (Fl. Jap., vol. i., p. 100 t. 50). Indeed, I cannot follow Dr. Wangerin in treating the Chinese specimens as specifically different from the latter. He states that *C. chinensis* differs from both of the species named in having much longer calyx-teeth, and from *C. officinalis* in having tufts of pale grey hairs in the axils of the veins on the underside of the leaves; whereas they are of a rusty brown colour in *C. officinalis*. There are numerous specimens at Kew, both from China and Japan, and the characters on which Dr. Wangerin relies are more or less inconstant, especially the relative size of the calyx-teeth. As for the tufts of hairs in the angles of the veins, they vary considerably, both in quantity and colour. A Japanese specimen, collected by Bisset (n. 1093), has white hairs in quite small tufts. On the other hand they are brown or white on different leaves of the same branch.

I have now no doubt that I incorrectly referred Wilford's 945 from Port Chusan, Corea, to *C. macrophylla*, Wall. in Journ. Linn. Soc., vol. xxiii., p. 345. Dr. Wangerin has since described it (Fedde, Repert., vol. vi., p. 97) under the name of *C. coreana*. It is also closely allied to *C. alba*. Père Faurie's 4353 (1889) "Montagnes de Managata," Japan, is another specimen of the same affinity; but as I have not studied the group to which *C. alba* belongs I must leave these specimens unnamed. *C. australis*, C. A. Mey., belongs to the same group. *C. Schindleri*, Wang., in Fedde, Repert., vol. iv., p. 337, is unknown to me.

XLVII.—TREES NOTED IN DEVONSHIRE.

W. Dallimore.

The contribution of an exhibit to the Forestry section of the "Bath, West of England and Southern Counties Agricultural Show," by the Director of the Royal Botanic Gardens, Kew, furnished the object of my visit to Exeter in June. While in the neighbourhood, I was able to pay visits to a few gardens of interest, where some fine specimens of trees were noted.

Strete Ralegh.

Amongst other interesting trees growing at Strete Ralegh, the S. Devon estate of Mr. H. Imbert-Terry, the following are specially noticeable on account of their size and rarity, *Larix Griffithii*, *Tsuga Brunoniana*, and *Saxegothea conspicua*. It is considered that these particular examples are some of the original introductions to the British Isles, and that they found their way to Strete Ralegh

at the time of the dispersion of the stock of the Exeter nurseries, when the old Veitchian firm dissolved partnership. Of the two first mentioned species single examples only are found, but of the *Saxegothea*, two specimens exist. All four are growing on sloping ground near the top of a hill, at an elevation of 500 ft., but they are sheltered by other trees from the north and east. The ground is rich and is kept continually moist by means of a spring, the water from which percolates through the ground thereabouts. This, with the natural humidity of the atmosphere and mild climate, appears to provide ideal conditions for these trees, for all are somewhat tender and averse to a hot, dry soil and a dry atmosphere.

The specimen of *Larix Griffithii* is about 45 ft. high with a girth of 7 ft. at 3 ft. from the ground. Himalayan travellers describe the species as a tree growing 40 to 60 ft. in height, found at an altitude of 8,000 to 12,000 ft. in the forests of the inner ranges of the Eastern Himalaya (E. Nepal, Sikkim and Bhotan), whilst it also occurs in Tibet at an altitude of from 9,000 to 13,500 ft. Plate XXI. in "Hooker's Himalayan Plants," gives a good idea of the tree and the beauty of the half developed cones. The chief peculiarities of the species are its long, pendulous branches and large cones with prominent scales and bracts which are remarkable for their long reflexed tips. The cones are several times larger than those of other species, being $2\frac{1}{2}$ to 3 inches in length. When young they are purple in colour. As the Strete Ralegh tree is coning profusely this year, it formed a conspicuous object in June. Though introduced as long ago as 1850, very few good specimens are to be found in the country.

Tsuga Brunoniana is also a Himalayan tree and is found in the same forests as *Larix Griffithii*. It attains its largest dimensions in the Lachen Valley, where Sir J. D. Hooker measured a specimen 120 ft. high, with a girth of 28 ft. (Gard. Chron., July 17th., 1886, p. 73). Under cultivation it does not form a single trunk, but branches at a few feet above the ground. The Strete Ralegh specimen is 45 ft. in height, with a girth near the base of 9 ft. 2 ins. It is of graceful outline, and branched to the ground all round. A larger example is recorded by Elwes and Henry in "Trees of Great Britain and Ireland" vol. ii., p. 245, from Boconnoc in Cornwall. This is 53 ft. high, with a girth of 12 ft. *S. Brunoniana* was first cultivated in English gardens in 1838.

Saxegothea conspicua was introduced from the mountains of Patagonia, by Messrs. Veitch, of Exeter, through the agency of their collector Wm. Lobb, in 1849. The Strete Ralegh examples are supposed to have originated from this consignment, and are now 30 ft. in height, the larger of the two having a girth of 4 ft. 3 ins. at 2 ft. from the ground. They somewhat resemble the yew in appearance, but are lighter in outline, The genus was named in compliment to the late Prince Consort, and from that the common name of "Prince Albert's Yew," has originated. When first introduced it excited considerable interest amongst botanists, and Lindley, in a description which appeared in the "Journal of the Horticultural Society" for 1851, pp. 258–263, says: "It may be described as a genus with the male flowers of a Podocarp, the female flowers of a Dammar, the fruit of a Juniper, the seed of a

Dacrydium, and the habit of a Yew." The Strete Ralegh examples are probably the finest in the country, and from their healthy appearance it is evidently a tree that might be planted more extensively in the south-west counties. Although perfectly hardy at Kew, it grows slowly and has a stunted appearance.

Killerton Park.

Killerton Park, Devon, the demesne of Sir Thomas Dyke Acland, Bart., is situated a few miles east of Exeter, in the midst of a beautifully undulated country, consisting of rich agricultural land. The estate is well timbered, and many fine old trees exist of indigenous and exotic species. In the rich soil of the park beech and oak assume magnificent proportions, whilst many fine trees of *Pinus insignis*, *Cupressus macrocarpa* and cedar are to be seen. It is in the gardens, however, that the more interesting trees are to be noted. A collection of the more tender species of *Cupressus* is noticeable, *C. torulosa* being specially worthy of note. The rare *Cunninghamia sinensis* is represented by examples 45 ft. high covered with cones; *Fitzroya patagonica* is 30 ft. high and well furnished with branches; *Thuya plicata* is 80 ft. high, whilst fine examples exist of *Abies cephalonica*, *Pseudotsuga Douglasii*, *Quercus Lucombeana*, and numerous other trees. Shrubs, too, are well represented. Japanese evergreen oaks such as *Quercus cuspidata* and *Q. glabra* form very large bushes; *Kalmia latifolia* is 12 to 15 ft. high and 23 ft. through, *Leucothoe Catesbaei* is represented by a bush 10 ft. through and 3 to 4 ft. high, which in June was a perfect mass of white flowers, whilst a large number of the more recently introduced shrubs are making satisfactory growth. A magnificent bush of *Berberis aristata* was noted; this was 18 ft. high with an enormous spread.

Stevenstone.

In the gardens at Stevenstone, the North Devon seat of Lord Clinton, a very fine collection of Conifers exists, but the majority are young, 40 years old and under. That they like their position, however, is evident from the fact that many have attained a height of from 50 to 65 feet. About the park are many clumps of Coniferous trees which show a remarkable rate of growth, for, though planted but 35 to 40 years ago, Douglas fir and larch are to be found between 70 and 80 ft. in height, with trunks 12 to 15 ins. in diameter. Fine examples were noted of *Magnolia Watsoni* and *Styrax japonica*. The former, though usually a slow grower of indifferent constitution, is represented by a free-growing bush 18 ft. high with seven main branches which, in June, were carrying over 100 open and unopened flowers. The *Styrax* is 16 ft. high, and a good bush.

XLVIII.—COFFEE DISEASES OF THE NEW WORLD.

G. Massee.

1. Mancha or Viruela (*Sphaerostilbe flavida*, Mass.).

The disease known as "mancha,"—spot, or "viruela"—small pox, in allusion to the spotted appearance of the leaves, young

shoots and fruit of infected trees, is almost of equal virulence as a destructive disease in the coffee plantations of Central America and Brazil, as is *Hemileia vastatrix* in similar situations in the old world. It is represented by specimens in the Kew Herbarium from Costa Rica, Guatemala, New Granada, Venezuela, Nicaragua, Dutch Guiana and Brazil. Up to the present the fungus causing this disease has been considered as belonging to the Hyphomycetes, one of the sections included under the term "Fungi imperfecti," and known as *Stilbum flavidum*, Cooke, with *Stilbella flavida*, Lindau, as a variant.

The disease has been known to exist for many years past, and formed the subject of a report in the *Kew Report* for 1876, p. 21. In 1878 Dr. A. Ernst published an account of this disease along with others affecting the coffee plant. Up to this date the true cause of the disease had not been determined, and insects, fungi and climatic influences were respectively considered as primary causes. In 1880 Dr. M. C. Cooke correctly attributed the disease to the presence of a minute parasitic fungus which he described under the name of *Stilbum flavidum*. Under the title "Central American Coffee-disease" some account of the fungus is given in the *Bulletin*, 1899, pp. 91–94. Somewhat similar blotches on the leaves are caused by the mining larva of a small moth—*Cemiostoma coffeellum* (see *Kew Bull.*, 1894, pp. 130–133). The Spanish name for this disease is "Mancha de hierro" or iron spot.

The leaves, young shoots and fruit are attacked. On the leaves the fungus forms scattered, circular whitish patches equally evident on both surfaces, varying as a rule from 5 to 8 mm. (about a quarter of an inch) in diameter. Leaves that are attacked soon become yellow and fall. In severe cases it is stated that a tree may become entirely defoliated within a month of the first appearance of the disease, and as the fungus reproduces itself and spreads rapidly under favourable weather conditions, it not infrequently happens that all the trees in a plantation present the remarkable appearance of being heavily loaded with fruit, but entirely destitute of leaves, as shown in some excellent photographs communicated to Kew by Professor Pittier from Costa Rica. The berries under such circumstances, do not reach maturity.

On the young shoots the diseased spots are whitish and usually more or less elongated; the cortex in such places becomes dry, cracks, and finally breaks away in small flakes, leaving the browned wood exposed. On the berries the spots are as usual, whitish and almost circular in outline. As a rule only one or two spots are present on a berry. After a time the fruit of the fungus appears on these bleached spots in the form of miniature yellowish pins standing erect, from 1·5–2 mm. in height. The stem is very slender, sometimes slightly wavy, and is composed of a fascicle of very thin hyphae cemented together to form a hollow cylinder. The external hyphae give off numerous very short lateral branches, which stand at right angles to the long axis of the stem, imparting to it a spiny appearance when seen under the microscope, but it appears to be smooth under a pocket-lens. At the apex of the stem the hyphae diverge in every direction forming a broadly pyriform head, those on the under side of the head bending downwards

and embracing the uppermost portion of the stem. The free tip of each hypha forming the head becomes swollen into a subglobose cell, from which spring several very slender, simple or sparingly branched conidiophores, each of which bears a single subglobose conidium at its apex. The conidia are hyaline, and average 2·5 μ in diameter. This is the condition known as *Stilbum flavidum*, Cooke, which now proves to be the conidial form of an ascigerous fungus belonging to the genus *Sphaerostilbe*.

Last January a large consignment of diseased coffee berries was received at Kew from New Granada. These berries had been carefully packed and arrived in a comparatively fresh condition; the *Stilbum* being present in abundance. A number of the diseased berries were placed on sterilised, damp cotton wool in Petri dishes, for the purpose of ascertaining whether the conidia could be induced to infect young coffee leaves. All attempts in this direction gave negative results, whether placed on the unbroken surface or on a wounded portion of the leaf; in fact the conidia could not be induced to germinate in any of the various media used. When the berries had been under observation for seven weeks, small clusters of a bright red fungus appeared on the bleached spots occupied by the *Stilbum*. This red fungus proved to be an ascigerous form, belonging to the genus *Nectria* in the wide sense, which has in recent years been broken up into several genera, and those ascigerous forms which develop along with a *Stilbum*-like conidial stage, constitute the genus *Sphaerostilbe*.

The leaves of three young coffee plants, two years old, were infected by placing the ascospores of the *Sphaerostilbe* stage of the fungus, upon definite spots of the unbroken surface of the leaves. At the expiration of 13 days the points of infection were yellowish-green in colour, and during the succeeding week the characteristic white patches bearing the conidial form of the fungus were developed. The ascigerous phase of the fungus did not follow, and it is possible that it does not develop on the leaves owing to lack of nutrition, but only on the fruit and shoots. This is what happens with other species of parasites, as for instance *Sphaerotheca pannosa*, *&c.*

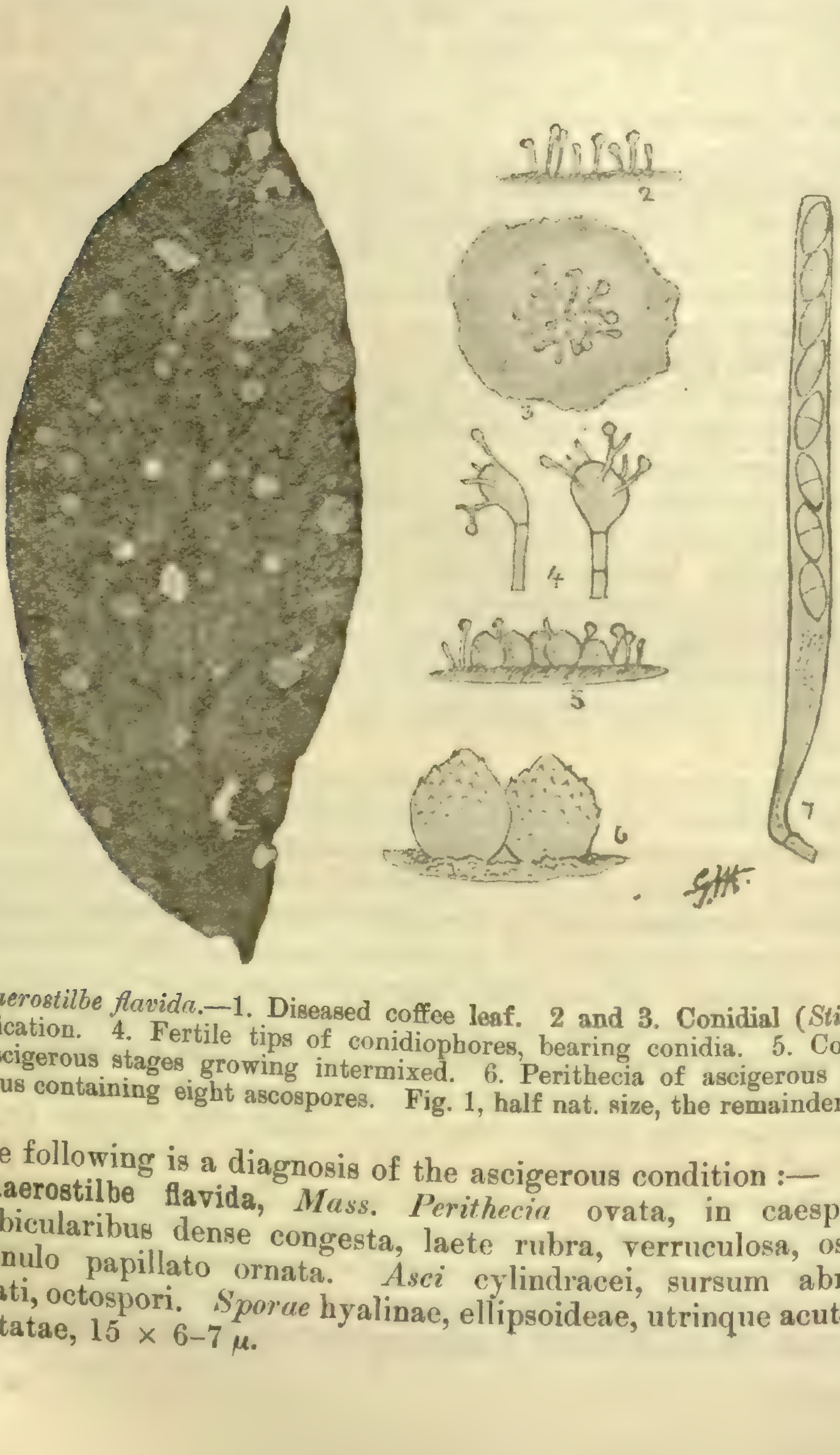
Further attempts to infect young coffee leaves with the fresh conidia produced at Kew, did not meet with success. This has also been the experience of all who have attempted the experiment; in fact no one has as yet succeeded in inducing these supposed conidia to germinate, and it is possible that the conidial condition of the fungus, although still developed, has reached an effete stage, and is no longer of functional value as a reproductive body. If this surmise proves to be correct, then the continuation of the fungus in time must depend entirely upon the ascigerous condition, which previous to the present record had passed unobserved.

There are two distinct ways by which the disease can be continued from year to year:—

(i) Diseased shoots will furnish a crop of ascospores which may infect the foliage and young shoots. When a shoot is once infected the mycelium of the fungus gradually encroaches on the healthy portion, producing a fresh outbreak of fungus fruit each season. From the above account it is obvious that all diseased shoots should

be removed and burned. Results will turn on the thoroughness with which this work is carried out. First year infected shoots may, perhaps, be rather difficult to detect, but a thorough investigation should be made, as the eradication of the disease depends on the removal of all sources of infection.

(2) All diseased fruit, whether hanging or fallen, should be collected and burned, as should also all fallen leaves. This is sometimes a very difficult matter when the lower branches of the trees are weighed down to the ground with fruit; however, a grower of great experience in Costa Rica informed me that it was a great mistake in allowing the lowermost branches of a coffee tree to remain, the result being imperfect aeration of the soil, also imperfect ventilation amongst the branches, and the impossibility of clearing away fallen leaves, &c., or of cultivating the ground.



Sphaerostilbe flavida.—1. Diseased coffee leaf. 2 and 3. Conidial (*Stilbum*) fructification. 4. Fertile tips of conidiophores, bearing conidia. 5. Conidial and ascigerous stages growing intermixed. 6. Perithecia of ascigerous stage. 7. Ascus containing eight ascospores. Fig. 1, half nat. size, the remainder mag.

The following is a diagnosis of the ascigerous condition :—

Sphaerostilbe flavida, *Mass.* *Perithecia* ovata, in caespitulis suborbicularibus dense congesta, laete rubra, verruculosa, ostiolo prominulo papillato ornata. *Asci* cylindracei, sursum abrupte truncati, octospori. *Sporae* hyalinae, ellipsoideae, utrinque acutatae, 1-septatae, 15 × 6–7 μ.

BIBLIOGRAPHY.

Kew Report, 1879, p. 21.

Kew Bull., 1899, pp. 91–94, 1 pl.

Cooke, M. C.; Grevillea, xi., 1880, p. 11. Journ. Linn. Soc., xviii., pp. 461–467.

Puttemans, M. A.; Bull. Soc. Myc. France, 20, p. 157 (1904).

Spegazzini, C.; Revista de la Facul. de Agronom. y Veter. de la Plata, No. 22, Oct. 1896.

2. Tap-root Disease of the Coffee Tree.

This disease is caused by a Nematode or eelworm, and has been recognised in the coffee plantations of São Paulo, in Brazil for some years past, although the definite cause has only recently been determined. A similar disease has been observed in the coffee plantations in Costa Rica, and judging from accounts received at Kew from time to time, it is also present in other districts in Central America. The characteristic symptoms of the presence of the disease depend to a great extent on the age of the tree attacked. When the tree is fairly old the leaves on young twigs turn yellowish-green and shrivel, the young shoots also assume a blackened appearance and wilt. This condition of things may continue for many months before the tree dies. On the other hand, in the case of trees from four to six years of age, having healthy looking dark-green foliage, and laden with berries, no preliminary symptoms are forthcoming and the collapse is sudden.

The tap-root is the part attacked by the eelworm, and presents a very characteristic appearance, becoming much swollen and barrel-shaped, and covered with much thickened, rugged bark sodden with water. The cork-cells of the bark are sac-like and much elongated radially, resembling the palisade tissue of a leaf. The eelworms are present in spaces between these abnormal cork-cells.

The smaller roots usually bear a number of small knots or galls containing eelworms.

Fungal hyphae are also generally present in the abnormal cortical tissues of the tap-root, but the eelworm is the primary cause of disease.

Batches of diseased trees show up very conspicuously and can readily be detected and removed. So far as experience goes a tree that is once attacked never recovers, consequently the wisest course is to remove all such trees and to burn the roots. The disease does not spread very rapidly, but at the same time it gradually extends its area from a central point of infection.

Treating the soil with bisulphide of carbon is the most effective remedy. This should be applied where diseased trees have been removed, and the treatment should also extend well beyond the zone of diseased trees.

BIBLIOGRAPHY.

Tobert, M. C., Comp. Rend., lxxxvii. (1878), p. 941.

Noack, Fritz von ; Zeitschr. Pflanzenkr., 8, p. 137.

XLIX.—MISCELLANEOUS NOTES.

Mr. J. W. Gallagher, whose appointment as Mycologist to the Agricultural Department of the Federated Malay States was recorded in *Kew Bulletin*, 1907, p. 100, has been appointed Director of the Department in succession to Mr. J. B. Carruthers, whose transfer to Trinidad was announced in *Kew Bulletin*, 1909, p. 150.

Mr. J. W. Campbell, formerly Superintendent of Experimental Plantations in the Federated Malay States (*K.B.*, 1906, p. 383), has been appointed Assistant Director, Agricultural Department, Federated Malay States.

Baikiaea insignis, *Benth.*—A fine healthy specimen of this remarkable Tropical African tree has produced about thirty of its handsome flowers in house No. 1 during August and the early days of September. The Kew specimen was raised from seeds received in 1894 and flowered for the first time in cultivation in 1907. It is now 15 feet high.

The plant was originally described by Bentham in *Benth. & Hook. Gen. Pl.* 581 as the type of a new genus and named in compliment to the distinguished West African traveller, W. Balfour Baikie, R.N. Surgeon to the Niger expedition, from specimens collected in those parts and from the island of Fernando Po. It was also described and figured later on in *Trans. Linn. Soc.*, vol. xxv., t. 41. In the figure the flowers are pendulous; they are, however, erect, and in this respect the figure is erroneous, having been drawn from dried specimens. The plant is stated to reach to a height of 30–40 feet in W. Tropical Africa.

The flowers are ten inches across when fully expanded, and are remarkable as being the largest produced by any member of the *Leguminosae*. The tree is of erect habit, evergreen, with large abruptly pinnate, coriaceous leaves from one to two feet long; pinnae slightly oblique, elliptic, six inches to a foot long, and sometimes as much as four inches in diameter. The flowers are borne in loose clusters on the tips, or in the axils of the upper leaves of the ripened wood of the current year. The calyx is 4 to 5 inches long and divides on opening into four linear segments, the three upper sepals reflex and curl round the stalk of the flower, the two lower remain united and form an erect boat-shaped support upon which rests the large somewhat fleshy lip. The corolla is erect on first expanding, but the petals gradually reflex at the tips and the whole flower is then about 10 inches in diameter. The petals are snow-white, spathalate, 6–6½ inches long and 3 inches broad, with undulating margins. The lower petal or lip is boat-shaped lemon-yellow in colour, and somewhat more fleshy in character than the other members of the corolla. The 10 stamens are in two series, the five longest being equal in length to the petals, the other five an inch shorter. The filaments are slender, villose on the lower half, nine being connate at the base. Anthers linear, versatile, ¾ of an inch long, primrose-yellow in colour. Ovary a slender legume two inches long, style slender, slightly shorter than the petals, stigma capitate, small.

The flowers commence to expand during the afternoon and are fully open about 7 o'clock in the evening, remaining fresh until next morning, when they quickly fade and fall to pieces.

C. P. R.

Silphium albiflorum, *A. Gray*.—This white flowered *Silphium* is at present in flower in a warm border close against a south wall. It is rarely met with in gardens as it is somewhat tender and needs a sheltered position like the above. It is a native of Western and Northern Texas where it is found on cretaceous rocks. Although it was figured in the *Botanical Magazine*, t. 6918 so long ago as 1887 from a plant which flowered with the late Mr. Thompson, of Ipswich, it never increased. The present plant was received from Herr Max Leichtlin, of Baden Baden, in 1907. It is most nearly allied to the well known *S. laciniatum* and has the same kind of foliage, but the whole plant only reaches the height of between two and three feet. The stems are very rigid, and the white flowers, about three inches in diameter, are borne on long peduncles. The whole plant is very scabrid.

Gentiana Freyniana, *Bornm.*—This new species was received from Herr F. Sundermann in 1906, and this year it has flowered freely for the first time in the rock-garden. It is closely allied to the well-known *G. septemfida*, and resembles that species in habit, but has much larger flowers. It also comes from Asia Minor, and as *G. septemfida* is so variable, three varieties being figured in the *Botanical Magazine*, tt. 1229, 1410, and 6497, it may perhaps be regarded as a variety of that species with larger flowers having a more dilated tube. The intermediate lobes are also less laciniate.

W. I.

Remedies for Snake-Bite.—In a note on the subject of "Remedies for Snake-bite" in a previous number of the *Kew Bulletin* (1909, No. 3, p. 156) two species of Acanthaceae were quoted as being specially efficacious. Specimens of these plants had been received from Dr. Arnold Lawson, and their names were given as *Barleria Prionitis*, Linn. and *Justicia Gendarussa*, Linn. f. The first of these, however, proves to be a different species, probably *Barleria lupulina*, Lindl.

As previously described (*Kew Bull.*, loc. cit.) the medicine is taken in the form of an extract made by pounding the leaves and twigs in rice-spirit. A small sample of this solution, together with the leaves and twigs (of *Barleria lupulina?*), from which it had been prepared, were sent to Kew by Dr. Arnold Lawson.

The material, which was insufficient for any detailed analysis, was handed to Dr. P. Haas, who kindly undertook to examine it for alkaloid- and potassium-constituents. These substances were specially sought for because Boorsma* found, on studying the

---

* Boorsma, Onderzoek naar de Plantenstoffen van Nederlandsch-Indie, Mededeel. uit 's Lands Plantentuin XXXI, Batavia, 1899.

chemistry of the *Acanthaceae*, that two features marked several species of this family:—(1) the presence of a large amount of potassium, and (2) the occurrence of alkaloids. The same features characterise the material examined by Dr. Haas, as will be seen from his report given below:—

"Report on the Examination of a Sample of Antidote for Cobra-Bite.

"The sample consisted of a clear light-brown solution with a brown sediment.

"The sediment [A] was filtered off and examined apart from the solution [B]; it was extracted with alcohol and tartaric acid, and the filtered extract examined for alkaloids, but none were found.

"The solution [B] was evaporated over a water bath and taken up with dilute hydrochloric acid; the solution so obtained gave characteristic precipitates with the three alkaloidal reagents potassium teriodide (chocolate), phosphomolybdic acid (yellow flocculent turning green) and potassium mercuric iodide (faint precipitate). A portion of the solution [B] evaporated to dryness and ignited left a small quantity of ash which consisted for the most part of potassium.

"The dry plant-remains, from which the above antidote had been prepared, yielded on ignition an ash which contained a considerable quantity of calcium and potassium, but relatively little sodium.

"P. Haas."

It appears possible that an alkaloid might act as an antidote for snake-bite, but the physiological action of the alkaloid in this species of *Barleria* must await further enquiry.

Several species of *Acanthaceae* have been credited with medicinal properties. Thus among reputed remedies for snake-bite are *Rhinacanthus communis*, Nees, *Andrographis paniculata*, Nees, and *Barleria cristata*, Linn.* The leaves of *Adhatoda Vasica*, Nees, "have a reputation as expectorant and anti-spasmodic, and are employed in consumption, coughs, chronic bronchitis, asthma and other pulmonary and catarrhal affections."† *Barleria Prionitis* is quoted by Boorsma as a febrifuge and diuretic, though containing no important organic substances. In this and in several other species of this family the relatively high percentage of potassium present is held by Boorsma to be responsible for any diuretic properties the plants may possess.

In most cases the alkaloids are stated to be present in small quantity, or to be unimportant, but other organic substances may be present, *e.g.*, andrographid in *Andrographis paniculata*, which is used as a remedy for dysentery; and rhinacanthin and cumarin in *Rhinacanthus communis*, which is used in cases of ring-worm.

In *Justicia Gendarussa*, Boorsma determined the presence of an alkaloid, and in *Adhatoda Vasica*, Nees (=*Justicia Adhatoda*, L.) Hooper‡ found an alkaloid (vasicine) and another organic body

* Lindley, Flora medica (1838), pp. 501–2; Boorsma, loc. cit.; Watt, Dict. Econ. Prod. India.

† Hooper, Pharm. Journ., third series, vol. 18, p. 841 (1888).

‡ Hooper, loc. cit., Boorsma, loc. cit.

adhatodic acid). Hooper came to the conclusion that these two bodies are chemically combined in the living plant as adhatodate of vasicine, and that vasicine is the active principle. Sulphate of vasicine was proved by experiment to be poisonous to frogs and leeches. Another experiment made by Hooper consisted in adding a few drops of a strong "solution" of the leaves of *Adhatoda Vasica* to a sample of pond-water containing *Spirogyra*, insect-pupae and numerous *Paramoecia*. The result of the experiment was that the alga and the animal organisms were all killed.

Hooper also tried the effect of an aqueous solution of the alcoholic extract of the leaves on flies, fleas, mosquitoes, centipedes, &c., and observed that it acted as a poison in every case, but he found that a considerable dose of the alcoholic extract given to a dog did not have any injurious effects.

It appears, however, that, as an insecticide, "vasicine cannot be used as at present available. A tartrate is in the market, but cheaper and equally efficacious insecticides already exist."*

It is stated that the fresh leaves of this plant are used in connection with rice-cultivation in some parts of India. They are scattered over the recently flooded fields, and are held by the native cultivators to act both as a manure, and as a poison, which kills the aquatic weeds.†

Assuming that marked medicinal properties are rightly attributed to *Adhatoda Vasica*,‡ it may be expected that some other members of the *Acanthaceae* will prove to contain drugs of a like nature or importance.

L. A. B.

A New Rubber Plant (*Asclepias stellifera*, Schlecht.).—Towards the latter end of last year herbarium specimens of a plant, with a small sample of rubber extracted from it by maceration, were received from Mr. J. Burtt Davy, Department of Agriculture, Transvaal. The sample of rubber was prepared by Mr. J. Ivens Ferraz, Official Translator to the High Commissioner of the Transvaal, but was too small to admit of a commercial valuation being placed upon it; the herbarium material, however, was sufficiently complete to allow of its botanical origin being satisfactorily determined.

Asclepias stellifera is a native of South Africa, growing from 3 to 10 ins. high, and, according to *Flora Capensis*, is found in the coast region at an altitude of 3,500 to 4,000 ft., in the Kalahari region at 4,000 to 6,000 ft., and in the Eastern region at 3,500 to 4,500 ft.

The rubber is yielded by the root, which is stated to be very long and perennial. The plant has been found in hard ground on the veld, struggling with all sorts of weeds, but thriving better where no other plants existed.

Upon comparing the specimens of the plant sent with material in the Herbarium, Mr. N. E. Brown found that in the tissues of a root-stock of a dried specimen collected 46 years ago, the rubber contained in them was quite as elastic as in the recently-collected

---

* Watt, The Economic Products of India (1908), p. 25.
† Watt, The Econom. Prod. India (1908); Hooper, loc. cit.
‡ Hooper, l.c.

material. Mr. Brown also points out that as there are several other species of *Asclepias* with much the same habit as the plant in question, it is just possible that some of them may also contain rubber, but in most cases the root-stocks are wanting in the herbarium specimens.

Subsequently nine larger samples of the rubber were received from the same source, and though few details bearing upon the varied methods adopted to bring about coagulation accompanied the samples, they were submitted for opinion to Messrs. Hecht Levis & Kahn, the well-known rubber experts, who found only one sample, which had been obtained from incisions without further treatment, to be worthy of serious consideration. This sample was found to be rubber of good quality and would probably have realized at the time (14.4.09) about 4*s.* 6*d.* per lb.

J. M. H.

Ancient British Oak Stake.—To the many examples of Oak of historical interest already contained in the Museums, one other of great local interest has been added through the generosity of Mr. Montagu Sharpe, D.L., Chairman of Middlesex Quarter Sessions, in the form of an ancient British stake extracted from the bed of the Thames at Brentford.

The following particulars of this interesting relic are taken from "The Great Ford across the Lower Thames," being the title of an exhaustive paper on the subject by the donor, which appeared in the *Archaeological Journal*, vol. lxiii., No. 249, March, 1906 :—

In the preface to the paper it is stated that "in early times we know that the south-eastern district of Britain was cut off from the interior by the Thames and its marshes, and that the first practical means of crossing this barrier was by the ford at Brentford, the next being 50 miles up stream at Wallingford.

"This Middlesex ford would therefore be a place of the first importance and also of general resort, since upon it converged the principal chariot or trackways for miles around, on each side of the river.

"In times of war this portal between two extensive areas would be jealously guarded and strongly protected, and this is proved by the numerous remains of pile fortifications which have now come to light, extending for a couple of miles along the Middlesex shore of the river, from Kew Bridge to Isleworth Ferry. The troops regularly guarding this position appear to have had a circular camp near by, higher up on the level ground, in a clearing midst the surrounding trees, situated on the tongue of land between the Brent and the adjoining brook, which commanded the fordway below. The next tribal line of defence was upon the wooded uplands of Middlesex, along which ran Grimms Dyke. At either end stood camps, at Hillingdon and Bush Hill, protecting the fords of the rivers Colne (Ux) and Lea."

* * * * * * *

"The Ford at 'Old England,' Brentford.

"Bishop Gibson, writing in 1695, says that the Thames was in ancient times easily forded at Brentford, and is so still, there being

now at low ebb not above 3 feet of water. There is confirmation of this in the *Saxon Chronicle*, which states that Ædmond the Ironsides crossed here with an army twice in 1016. William of Malmesbury (1095–1143) on each occasion refers to the place as the Brentford vadum. Even at the present day, during a low spring tide, children in the warm weather may be seen wading well out into the river.

"There was but little tidal scour in those days, for irregular banks, shoals, weeds, reeds and fallen trees, &c., coupled with the lateral flow over miles of swamps, would all tend to impede the flow in the river proper. Constant dredging at this day takes place upon the gravel shingle in the Syon reach of the river to deepen the Brentford channel for navigation, and from the above various causes it can be imagined that 2,000 years ago the river at this spot was much shallower than at present, and therefore easily fordable at low tide. All the accessories of a ford convenient for military purposes were to be found here. On the Surrey side a wide and level approach over a firm and low-lying bank (B.M. 13) led down to a shallow river of no width, flowing in this reach over a broad bed of gravel.

"The passage across probably lay up stream, a little above the line of route of the present ferry. The old ford was a double one, as an arm of the Brent had afterwards to be crossed before ascending the gravel ridge (B.M. 25) which lies between the bend of the Brent to the north and the brook from Little Ealing. On the intervening triangle of land forming the delta of the Brent lay the town meadow, happily named and still known as 'Old England.' Its old appearance has now, alas! gone for ever; nearly all lost in docks and buried beneath railway embankments."

The following description is given of the stake :—"It is part of an oak sapling, is 3 feet long and 15 inches in circumference, roughly pointed at the lower end, and black as ink. There is little sign of decay, though, in process of drying, through exposure to the air, rifts or splits down the way of grain have appeared. The remainder of the sapling, which stood in and above the water, has of course long ago decayed or been broken off, but the stump owes its preservation to having been buried in the bed of the river. Its upper end, which projected a couple of inches above the bed, is frayed from contact with the dredger, or keels of passing vessels, and the action of river drift. The condition of some of the other stumps is not so good, it varies very much; the cores, however, are fairly sound and hard."

In December, 1903, Mr. Bunting, of the Thames Conservancy, wrote to Mr. Sharpe as follows:—"The remains of the line of stake defence still exist in the bed of the river for about 400 yards below Isleworth Ferry. It runs in a diagonal direction down stream from the Middlesex to the Surrey side, and their positions have been carefully ascertained. In the course of dredging, the stumps of many of the stakes have been extracted in the main channel, and those on the foreshore have been removed, as they became an obstruction or danger to navigation. The extracted stakes have from their appearance indicated that they have been tied or interlaced in some way or other."

Mr. Sharpe continues that "it can now with confidence be asserted that these works (the line of stakes) extended for about two miles along the course of the river . . . . the passage of the ford being about the centre. The number of vertical stakes used in a single line crossing the stream diagonally at either end and stiffened with two other lines below 'Old England' would, when driven in 6 feet apart, have amounted to between two and three thousand . . . . ." There is also good evidence "that stakes were driven into the *foreshore* as well as the main channel; this accords with Caesar's description, when he says that the *bank* was also defended" :—

"B.C. JULY 54. CAESAR'S INVASION WITH 20,000 MEN.

"Caesar being aware of their plans, led his army to the Thames to the kingdom of Cassivellaunus. The river was passable on foot only at one place and that with difficulty. . . . .

"The bank also was defended with sharpened stakes fixed outwards, and similar stakes were placed under water and concealed by the river."

Mr. Sharpe's paper is illustrated by an old plan of the district around the Thames Ford B.C., a view of the river bank at "Old England," a photograph of one of the stakes, a plan of the position of the stakes in the river at the upper end of the line of fortifications guarding the ford, and some other maps relating to the history of this ancient ford.

J. M. H.

Heritiera utilis.—Herbarium specimens of a sterculiaceous tree bearing the native name "Nyankom" were received in April, 1908, from Mr. H. N. Thompson, who had collected them in the Gold Coast Colony. The material, which comprised a single branchlet with leaves and detached fruits, evidently represented an undescribed species of *Sterculiaceae*. In the absence of flowers, the genus could not be determined with certainty, though a comparison of the fruits suggested that it might be *Triplochiton*. As "Nyankom," however, was stated to yield a valuable timber, exported to Europe as "Mahogany," it seemed desirable to publish a botanical description, and it was accordingly described under the name *Triplochiton utile* (*Kew Bull.* 1908, p. 257). Almost simultaneously with publication, a further specimen, bearing female flowers, was received from Mr. Thompson, and examination of this showed that "Nyankom" belonged to the genus *Heritiera*. It must now be known, therefore, as *H. utilis*, Sprague.

H. utilis may be distinguished from the other species of *Heritiera* by its maple-like fruits. *H. Papilio*, Beddome, and *H. acuminata*, Wall., also have winged fruits, but the wing is of a different shape.

T. A. S.

Botanical Magazine for September.—*Aphelandra tetragona*, Nees, a Tropical South American species, has been in cultivation at Kew for many years. As *Justicia cristata* it was figured by Jacquin in 1798 from a specimen grown in the Hortus Schoenbrunnensis, and

it is probably the same as *Aphelandra cristata*, R.Br., figured at t. 1578 of this work, though in that plant the flowering spikes are much shorter and the leaves smaller. *Megaclinium purpureorachis*, De Wildem., was discovered by Mr. Louis Gentil on the Upper Lomami, a tributary of the Congo, in 1903, but the flowers were unknown till last year when a plant, originally procured from Messrs. F. Sander & Sons, bloomed in the Royal Botanic Garden, Glasnevin, and material was sent to Kew by Mr. Moore, from which the figure now published was prepared. It is much the largest known species of the genus. *Exostemma subcordatum*, Krug & Urban, is a pretty Rubiaceous shrub from the West Indies. Its white fragrant flowers have a slender tube, long linear corolla-lobes, and exserted stamens, and are borne in a large terminal subcorymbose head. The plant figured was received in 1903 from Professor Hansen, Director of the Botanic Gardens, Giessen, under the name of *E. floribundum*, but from that species it is distinguished by its longer calyx-segments and subcordate leaves. *Euphorbia Ledienii*, Berger, is a succulent species, with angular and spiny stems and branches, and clusters of small yellow flowers. It is a South African plant, and has been in cultivation at Kew since 1868. *Peliosanthes violacea*, Wall., var. *Clarkei*, Baker, differs from the typical form in having deep purple, instead of deep violet, flowers. It is widely spread in South Eastern Asia from the Khasia Hills in Assam, southwards to the Malay Peninsula. The plant figured was sent to Kew in 1904 by Mr. H. N. Ridley, who had obtained it in Perak.

Fockea capensis.—Dr. R. Marloth has kindly supplied us with the following interesting note on *Fockea capensis*, Endl.

The only specimen of this species known (until recently) is a plant cultivated at the Imperial gardens of Schönbrunn near Vienna, where it was sent over 100 years ago. No collector seems to have gathered flowering specimens in South Africa (*see* Mr. N. E. Brown's remarks in the recently published volume of the *Flora Capensis*, vol. iv., sect. 1, 1908, page 781), and only a year ago one of the illustrated magazines published a photograph of the Vienna plant, with the explanation that this was the only survivor of a now extinct species.

Mr. Brown, however, concludes his note more carefully by saying: "I have maintained the plant as a distinct species (from *F. glabra*, Decsne.), leaving future discoveries to prove or disprove the correctness of this view." How correct Mr. Brown's critical attitude was, is shown by the discovery of the wild plant in the neighbourhood of Prince Albert. Three years ago (1906) when visiting the district, I found young shoots protruding from a large tuber of an asclepiad on the Sandriver mountains, which are situated a little east of Prince Albert and belong to the quartzites of the Wittebergen series. The plant appeared to me to answer to the description of *Fockea capensis*, Endl., but my attempts to obtain flowering specimens through the help of some friends, to whom I sent photographs of the plant, remained fruitless until now; hence I did not venture to publish my observation. This year,

however, owing to ample rains during the summer months, the plants flowered freely, and Dr. P. C. Luttig at Prince Albert sent me an ample supply. There is no doubt about the identity, as the plants agree well with the description given in the *Flora Capensis* and as Mr. Brown has kindly verified my determination. I have only to add, that the follicles are spindle-shaped, 1½ to 2 inches long, greenish-grey and speckled with brown.

The plant is fairly common, for I saw considerable patches of its shoots among the shrubs of the hill-slopes. The tuber reaches an enormous size, being of a somewhat irregular shape, from 1–2 feet long and 6 to 10 inches in diameter, weighing not rarely 50 pounds or more. The surface is brown, rough and warty, not whitish and smooth like those of *Fockea undulata*, N. E. Br. and *F. angustifolia*, K. Schum. These two species have turnip-shaped edible tubers, which the shepherds unearth and eat in the raw state or have them boiled with sugar and turned into a kind of preserve, much esteemed by the farmers. *F. capensis*, on the other hand, is not eaten and is distinguished by them as "berg-barroe," while *F. angustifolia*, is the "kam-barroe" and *F. undulata*, the "veld-barroe."

The plant, like many other Karroo plants, flowers according to the time of the rains. If they are scanty no flowers are produced for one or more years, if they are early, *e.g.*, in midsummer, flowers appear in March, otherwise they may be later, viz.: April, May or June.

R. Marloth.

The rediscovery of *Fockea capensis* by Dr. Marloth is one of considerable interest, as until now its native locality was unknown. In appearance, small crisped leaves and other details, the specimen forwarded to Kew by Dr. Marloth, appears to be quite identical with the type, and now that the plant has been rediscovered and seeds are procurable, it would be of great interest to learn something about the rate of growth of the tuber. When it was originally described by Jacquin (*Fragmenta*, p. 31, t. 34, fig. 5) between 1800 and 1804, he stated that the tuber was about 1 foot long and 6 inches in diameter, yet during the past 105 years this same tuber (for all efforts to propagate it have failed) appears to have made no material increase in size, as will be seen from the subjoined table of measurements made at the various dates it has been reported upon during a recent period of 20 years. The measurements have been kindly supplied by Dr. Zahlbruckner, Director of the Hofgarten, Vienna.

Circumference of tuber when reported :—

Dec. 15, 1886	40·8 cm.	Oct. 15, 1897	41·1 cm.
June 22, 1889	40·7 ,,	June 23, 1898	40·8 ,,
July 13, 1891	40·6 ,,	Aug. 1, 1899	40·9 ,,
June 20, 1892	39·7 ,,	Apr. 27, 1900	40·7 ,,
Sept. 1, 1892	40·8 ,,	May 25, 1902	40·4 ,,
June 14, 1893	40·9 ,,	Aug. 4, 1902	41·5 ,,
Feb. 13, 1895	40·6 ,,	Aug. 20, 1903	41·1 ,,
July 16, 1895	41·5 ,,	July 18, 1905	41·0 ,,
Mar. 28, 1896	40·6 ,,		

In the *Proceedings of the Linnean Society* for 1907, p. 7, will be found a note upon the Vienna plant, where the estimate I made as

to the rate of growth of the tuber, based entirely upon measurements made of a photograph, does not correspond with those given above and is evidently greater than is actually the case. The variations indicated by the table probably depend chiefly upon the amount of water stored up in its tissues, since, in 1892, when the circumference was least, Dr. Zahlbruckner notes that the tuber was "much dried up." From all this it would appear therefore that either the tuber attains its maximum development from the germination of the seed in a comparatively short period and afterwards does not enlarge, or else the rate of growth must be excessively slow. If the latter suggestion is correct some of the large tubers referred to by Dr. Marloth would probably be many centuries old.

N. E. B.

Bussea xylocarpa, *Sprague et Craib* [Leguminosae—Caesalpinieae]; a *B. massaiensi*, Harms, foliis 3–7-jugis et pinnis 10–15-jugis differt.—*Calliandra xylocarpa*, Sprague in *Kew Bull.* 1908, p. 290.

Bussea massaiensis was originally described from flowering material as a *Peltophorum*; and *B. xylocarpa* from fruiting material as a *Calliandra*. According to Harms, the affinity of *Bussea* is with *Caesalpinia*.

T. A. S.

Sir Joseph Banks, the Father of Australia.—Under this title Mr. J. H. Maiden, the energetic Director of the Botanic Gardens, Sydney, N.S.W., has welded a chain of historical events and facts in further vindication of Sir Joseph Banks' claims as a scientific man, and as a man to whom both the Old Country and the New Dominion are deeply indebted for his persistent and successful efforts in initiating the colonization of Australia. Mr. Maiden is an enthusiastic botanist, and he is much more; he is an enthusiastic historian, especially of the progress of botanical exploration in Australia, which began with the discovery of the country and was continued, thanks largely to Banks, through the earliest general investigations of the country. Dampier, the great navigator who discovered and explored some parts of the north-western coast about a century before Cook, was a born naturalist, and he brought away specimens of a few plants constituting the meagre flora of the part visited. It was otherwise with Cook when he first landed on the east coast. With him were Banks and Solander and several draughtsmen, whose task it was to collect, describe and draw the natural productions of the countries visited. Banks, of course, was the leader of this scientific staff, and Maiden claims for him that from this date (1770) onward his interest in the country and his activity in promoting its settlement and providing it with useful plants and animals never ceased. These facts are known to a few students of history; yet, as Maiden remarks, his services have not been adequately recognised either by Britain or by Australia. Owing to various circumstances, his share in this great work was overshadowed, and until the recent publication of his journal of the voyage, edited by Sir Joseph Hooker, and the publication of the Illustrations of Australian Plants, edited by Mr. James Britten, the general public

had little means of forming a correct appreciation of what he had really accomplished. Mr. Maiden's book of some 260 pages and 61 illustrations is intended to instruct the Australian people more especially in the part played by Banks, and the proceeds of its sale, it is hoped, will furnish a substantial contribution to the fund being collected for the purpose of establishing a memorial to him. It has been brought out at the expense of the State of New South Wales, and it is indeed an admirable *multum in parvo*, which should well fulfil the object desired. But the contents appeal to the Briton the world over, and should be widely read. Mr. Maiden dwells on the spot where Banks first trod the soil of the new continent, and where the colonization of the great country began, and his little book is calculated to feed the fire of true patriotism which has so lately burst forth. It consists largely of extracts from authentic publications and manuscripts relating to the events and persons concerned, of whom Banks is the central figure; and it covers Banks' whole career. There is a short chapter on the advantages enjoyed by the young colony and by Kew from an interchange of seeds and plants. Unfortunately no records now exist of the plants thus exchanged. They were probably burned in 1849 with the correspondence and other documents connected with Kew during the long Aitonian period. The first edition of Aiton's *Hortus Kewensis* is, however, an index to the introduction of Australian plants by Banks. In this connection we learn from the historical records that Banks had to repeat his proposals to send useful plants by Government vessels, and his suggestions as to how they should be sheltered and treated during the long voyages of those days of sailing vessels. George Sutton—an ancestor of Sir Francis Sutton, now President of the New South Wales Legislative Council, and an ardent supporter of Mr. Maiden in his present work—was actively engaged in the conveyance of plants from this country to the infant colony and in one of his letters to Sir Joseph Banks, reproduced by Maiden, he gives a list of the plants he had succeeded in introducing alive. One is tempted to make extracts, but it is better to commend the book for perusal and reference.

W. B. H.

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 9.] [1909.

L.—GARDEN NOTES ON NEW TREES AND SHRUBS.

W. J. Bean.

I. New Chinese Species.

The wonderful beauty and variety of the arborescent flora of Western and Central China, long ago suggested to us by the dried material of Mr. A. Henry and other travellers, is now being strikingly revealed by the living plants themselves. The present decade has witnessed the introduction to cultivation of a more remarkable assemblage of new hardy trees and shrubs than any previous one, even if we include the busiest years of such collectors as Douglas, Fortune, and William Lobb. Primarily, we owe this to the business enterprise of Messrs. J. Veitch & Sons, and to the liberality of Harvard University. Two expeditions on behalf of the former and one on behalf of the latter have been made by Mr. E. H. Wilson, an élève of Kew. The combination of qualities that have made him one of the greatest of plant collectors must be recognised as having had much to do with their success.

One of the most remarkable things about these Chinese introductions is the number of new and monotypic genera that there are amongst them. Apart from whatever beauty of flower or leaf they may possess, there is always a peculiar charm and interest attached to these solitary types. Most of the following are of this character, and it is thought that a few notes placing on record their first introduction to cultivation and a brief description of their leading features may be of some value to the growing number of cultivators of hardy trees and shrubs in the British Isles.

Carrieria calycina, *Franchet* [Bixaceae]; Revue Horticole, 1896, p. 498 with fig.

A deciduous tree 20 to 30 feet (sometimes 40 feet) high, with a wide-spreading head of branches. Leaves ovate, up to 5 inches in length with a short acuminate tip, coarsely crenate. Flowers in terminal panicles 6 inches long, cup-shaped, 1 inch across, very pubescent, bluish-white. Fruit a capsule 3 to 4 inches long, covered with pubescence.

(14572—6a.) Wt. 108–471. 1375. 11/09. D & S.

Mr. Wilson describes this tree as one of great beauty in flower. It was introduced by him for Harvard University, and from seeds presented to Kew by that institution this year, small plants have been raised.

It is a native of Central and Western China at altitudes of 2000 to 3000 feet. Of its hardiness nothing certain can be stated, but other trees and shrubs from similar elevations have proved capable of withstanding our winters. Monotypic.

Dipteronia sinensis, *Oliver* [Sapindaceae]; Hooker's Icones Plantarum, t. 1898.

Although closely allied to the Maples this species is remarkably distinct, especially in foliage and fruit.

It is a bush or small tree up to 25 feet in height, with deciduous pinnate leaves, about 1 foot in length on adult trees. The leaflets are usually nine to thirteen in number, opposite, 3 to 4 inches long, ovate to lanceolate, sharply and coarsely serrate. The small white flowers are borne in erect pyramidal panicles 9 to 12 inches long. The fruits are winged like those of a Wych Elm or a *Ptelea*, being flat, obovate, and $\frac{3}{4}$ to 1 inch long.

This tree is growing well in Messrs. Veitch's nursery at Coombe Wood and has recently been presented by them to Kew. It is undoubtedly hardy and, having a marked beauty of flower and leaf as well as very interesting fruits, it should prove a most desirable acquisition to gardens.

A native of Central China up to 5000 feet. Monotypic.

Kolkwitzia amabilis, *Graebner* [Caprifoliaceae].

This is a deciduous shrub 5 to 6 feet high, with opposite, ovate leaves, 2 to 3 inches long, shallowly serrate and very pubescent. The flowers do not appear to have been seen by botanists, but the fruits are quite remarkable. They are produced in short terminal clusters, each fruit about $\frac{1}{4}$ inch across, covered, like the pedicels, with numerous long, yellowish-brown bristles; and standing out beyond each fruit is the persistent elongated calyx, with its five narrow, radiating lobes.

This singular shrub has for several years been growing in the Combe Woode nursery, having been introduced for Messrs. Veitch by Mr. Wilson. Through their kindness it has been added to the Kew collection.

It grows in Hupeh on the watershed of the Han and Yangtse Rivers, among rocks at 9000 to 10,000 feet altitude. Coming from these elevations it should undoubtedly prove hardy. Monotypic.

Prinsepia sinensis, *Oliv.* MS. [Rosaceae-Pruneae].—*Plagiospermum sinense*, Oliver, in Hooker's Icones Plantarum, t. 1526.

When this shrub was first described by Professor Oliver as *Plagiospermum* in Hooker's Icones Plantarum, t. 1526, it was, in the absence of fruit, doubtfully placed in *Celastraceae*. That was in 1886, and since then not only has fruit become available, but the plant itself is in cultivation. It is now found to belong to *Prinsepia*, a small genus of *Rosaceae*. Kew owes it to the generosity of M. Philippe de Vilmorin, who sent a small plant in the autumn of 1908 which stood uninjured in the Arboretum nursery during last winter, and is now very healthy.

This is a deciduous spiny shrub of lax spreading habit, now about 6 feet high with M. de Vilmorin at Verrières. Leaves alternate, oblong-lanceolate, 1½ to 2 inches long, ½ inch wide, produced in fascicles on the year-old branches along with the flowers. Flowers bright yellow, ½ to ¾ inch across, produced singly on slender peduncles 1 inch long in few-flowered fascicles. Fruit red, resembling a small plum.

A native of Manchuria, and appears to be a very attractive flowering shrub of a type quite new to gardens.

Poliothyrsis sinensis, *Oliver* [Bixaceae]; Hooker's Icones Plantarum, t. 1885.

There is already in gardens a very interesting Bixaceous tree—*Idesia polycarpa*—to which this new *Poliothyrsis* bears a close superficial resemblance.

The latter is a small tree, 30 feet or so high, with variable but more or less ovate leaves 6 to 9 inches long, 3 to 6 inches wide, pointed and shallowly toothed. The flowers are greenish-white and borne in a large, erect panicle. The fruit is a dry, ellipsoid capsule, ¾ inch long, and thus very distinct from the globose, dark red berry of the *Idesia*.

Its fine broad leaves should make it a desirable lawn tree. It is common in Hupeh at 2500 to 3000 feet, and was introduced by Mr. Wilson for Harvard University in 1908. From seed presented to Kew by that institution a number of small plants have been raised, most of which survived last winter planted out in the Arboretum nursery.

Sinofranchetia sinensis, *Hemsl.* [Berberidaceae]; Hooker's Icones Plantarum, t. 2842.

The *Lardizabaleae* section of this Natural Order is already represented in gardens by the asiatic genera *Holboellia* and *Stauntonia*, to which this new plant is allied. Neither of them is really hardy away from a wall or similar protection, whereas five plants of the *Sinofranchetia* in the nursery at Kew passed through the winter of 1908–9 absolutely unaffected by cold, although they were only young seedlings planted out the previous spring.

This is a large deciduous climber which covers trees 40 feet high. Its main stem is often 3 to 4 inches thick, and, after the fashion of its allies, the branches uphold themselves by twining round whatever support is available. The leaves are ternate, glaucous; the petiole 6 to 9 inches long. The flowers are dull white, small and inconspicuous, and of no beauty. The fruits, however, are striking; they are borne in threes at intervals on an elongated rachis 8 inches or more long, each fruit blue-purple and about the size of an average grape.

A native of Central and Western China, up to 7000 feet, introduced for Harvard University. Monotypic.

Sinowilsonia Henryi, *Hemsl.* [Hamamelidaceae]; Hooker's Icones Plantarum, t. 2817.

A deciduous shrub or small tree occasionally over 20 feet in height. The leaves are broadly elliptic to obovate, rather like those of a lime, 3 to 6 inches long, strongly veined beneath and

covered there with a copious, stellate pubescence ; margins bristly-toothed. The greenish flowers are in slender pendulous racemes 9 inches long.

Introduced by Mr. Wilson for Harvard University from Hupeh, China, where it inhabits the banks of mountain streams at altitudes of 3000 to 4000 feet. Of its hardiness nothing definite can be said at present, but judging by its habitat it ought to be as hardy as the *Sycopsis*, to which it is very closely allied, The genus is at present monotypic, but some young plants growing in the Coombe Wood nursery under a different number from that of *S. Henryi* may perhaps prove to be another species of this genus.

Sycopsis sinensis, *Oliver* [Hamamelidaceae] ; Hooker's Icones Plantarum, t. 1931 and t. 2834 (♂ flowers).

Although several species of *Sycopsis* are known, this is the only one hitherto found which is capable of withstanding our winters. There is no doubt it is perfectly hardy. Without any protection, young plants stood the winter of 1908–9 quite unaffected.

It is an evergreen shrub up to 20 feet high, its habit, according to Mr. Wilson, comparable to that of our native hazel (*Corylus Avellana*). The leaves are ovate-lanceolate, 2 to 4½ inches long, rather coriaceous, slightly toothed or entire, glabrous. The plant has little beauty of blossom, having short dense racemes of flowers, the most conspicuous feature of which are the red stamens. Still, it adds a new type to a group of hardy shrubs of exceptional interest and distinction.

Native of the mountains of Central China at 4000 feet.

Tapiscia sinensis, *Oliver* [Sapindaceae] ; Hooker's Icones Plantarum, t. 1928.

A small deciduous tree usually about 30 feet high, although one specimen found by Mr. Wilson was 90 feet high with a trunk 12 feet in girth. The leaves are pinnate, 12 to 18 inches long, the leaflets ovate-cordate, serrate, acuminate, 3 to 5 inches long, half as much wide, greyish beneath. Flowers in axillary panicles 4 to 6 inches in length, yellow, quite small (1/12 inch long) with a pleasant honey-like fragrance. Fruit ovoid, ½ inch long, black.

Young plants of this species raised from seed presented by Harvard University survived last winter in the Arboretum nursery. Should it prove to be hardy its fine pinnate leaves (changing to yellow in autumn) and its fragrant flowers should make it a welcome addition to our collection of small trees.

A native of Western Szechuan and Western Hupeh at altitudes of about 4000 feet, fairly common in the former province, but rare in Hupeh. Monotypic.

Tetracentron sinense, *Oliver* [Trochodendraceae] ; Hooker's Icones Plantarum, t. 1892.

According to Mr. Wilson this is amongst the very largest of the broad-leaved trees of the Chinese forests (that is, excluding Conifers). It is often 80 feet and upwards high, with a trunk 20 feet in circumference. It belongs to that curious family, allied to *Magnoliaceae*, which has been formed to include such diverse genera as *Trochodendron*, *Eucommia*, *Cercidiphyllum* and *Euptelea*,

TAPISCIA SINENSIS.

[*To face page* 356.

TETRACENTRON SINENSE.

[*To face page* 357.

all, with the exception of the last, monotypic. The *Tetracentron* bears a considerable resemblance to *Cercidiphyllum japonicum*, but is roughly distinguished by its invariably alternate leaves.

It was introduced by Mr. Wilson for Messrs. Veitch about 1901, and presented by them to Kew. It is certainly quite hardy.

The leaves are deciduous, broadly-ovate with a subcordate base, 4 to 5 inches long, serrate, with five or seven prominent longitudinal nerves. Flowers small, yellowish, in slender spikes about 4 inches long.

A native of Central and Western China from 5000 to 9000 feet. Monotypic.

By the kind permission of Professor Sargent, Arnold Arboretum, Harvard University, photographs of the two last-mentioned plants taken by Mr. Wilson in China are reproduced on the accompanying plates.

Explanation of Plates.

1. **Tapiscia sinensis,** 90 feet × 12 feet, Western Szechuan ; altitude 4,100 feet. The largest specimen found.
2. **Tetracentron sinense,** 70 feet × 8 feet. Chino - Tibetan borderland ; altitude 8,000 feet.

LI.—DECADES KEWENSES.

Plantarum Novarum in Herbario Horti Regii Conservatarum.

DECAS LIV.

531. **Xylia Kerrii,** *Craib et Hutchinson* [Leguminosae-Adenanthereae]; affinis *X. dolabriformi,* Benth., sed foliis subtus velutinis et antheris eglandulosis differt.

Arbor, ramis irregulariter canaliculatis glabrescentibus, ramulis junioribus brunneo-tomentellis. *Folia* petiolata, bipinnata, pinnis unijugis, petiolis 2–3·5 cm. longis apice glandula magna ornatis puberulis ; rhachis 8·5–10 cm. longa, basi incrassata ; foliola 3–5-juga, plerumque opposita, elliptica vel oblongo-elliptica, breviter obtuse acuminata, basi rotundata vel leviter cordata, usque ad 10 cm. longa et 5 cm. lata, chartacea, arcte reticulata, matura supra glabra, subtus velutina, nervis lateralibus utrinque 7–9 arcuatis utrinque conspicuis ; petioluli circiter 2 mm. longi, teretes, tomentosi, inter eos glandula conspicua ; stipulae subulatae ; stipellae plerumque conspicuae, lanceolatae. *Capitula* multiflora, axillaria, solitaria vel fasciculata, pedunculata, pedunculis 3·5–7 cm. longis sulcatis brunneo-pubescentibus. *Bracteae* filiformes ; bracteoleae elongato-spathulatae, superne subteretes, 3·5 mm longae, ferrugineo-pubescentes. *Calycis* tubus 2–3 mm. longus, extus ferrugineo-pilosus ; lobi 0·75–1 mm. longi, deltoideo-rotundati, extus ferrugineo-tomentosi. *Petala* oblanceolata, obtusa, basi valde attenuata, 4 mm. longa, superne 1 mm. lata, extus ferrugineo-pilosa. *Stamina* 10. *Ovarium* oblique ellipsoideum, 2 mm. longum, ferrugineo-tomentosum ; stylus 5–7 mm. longus, truncatus, glaber ; ovula 8.

Legumen compressum, subfalcatum, lignosum, durum, 12 cm. longum 4 cm. latum. *Semina* 6, elliptica, 1·2–1·5 cm. longa, 0·8–1 cm. lata, compressa, nitida.

Malay Peninsula. Siam : Chiengmai, a medium-sized tree growing in deciduous jungle at the foot of Doi Sootep, about 330 m., *Kerr*, 547.

532. **Terminalia mucronata,** *Craib et Hutchinson* [Combretaceae-Combreteae] ; affinis *T. corticosae*, Pierre, sed floribus majoribus et staminibus quam calyce multo longioribus differt.

Arbor magna, superne ramosa (ex Kerr), cortice cano, ramulis pallidis lenticellatis glabrescentibus junioribus fulvo-tomentosis. *Folia* subopposita decidua, elliptica, oblongo-elliptica vel ovato-lanceolata, basi plerumque inaequaliter cuneata, acuta vel vix acuminata, vel matura apice obtusa vel retusa, sed omnia mucronata, usque ad 11 cm. longa et 7 cm. lata, junioria coriacea, supra sericeo-pubescentia, subtus fere fulvo-tomentosa, maturiora chartacea, utrinque pubescentia, nervis lateralibus 8–15 supra conspicuis subtus elevatis ; petioli 1–2·2 cm. longi, 2–3 mm. diametro, fulvo-tomentosi, apice glandulis duobis lateralibus ornati. *Spicae* terminales, multiflorae, 9–13 cm. longae, post anthesin circiter 1·5 cm. diametro ; pedunculus usque ad 1 cm. longus. *Bracteolae* lineari-lanceolatae, 2 mm. longae, fulvo-tomentellae. *Flores* virides (ex Kerr). *Calycis* limbus cupulatus, 5-dentatus, 2–2·5 mm. altus, 3–4 mm. diametro, utrinque pilosus. *Stamina* 10–12 ; filamenta circiter 5 mm. longa, flava, glabra, antheris 0·75 mm. longis. *Stylus* quam filamenta paullo brevior, glaber, basi dense villosus. *Fructus* suborbicularis, emarginatus, 3–4 cm. diametro, late 2–3-alatus, fulvus, alis 1–1·5 cm. latis rigide papyraceis.

Malay Peninsula. Siam : Chiengmai, in deciduous jungle on Doi Sootep, 540 m., *Kerr*, 593.

533. **Micholitzia,** *N. E. Brown*, gen. nov. [Asclepiadaceae-Marsdenieae] ; affinis *Marsdeniae*, R. Br., sed corollae lobis stricte valvatis et coronae lobis tuberculiformibus patentibus differt.

Calyx parvus, 5-partitus. *Corolla* urceolato-tubulosa vel conico-tubulosa, breviter 5-loba, intra villosa, lobis stricte valvatis. *Corona* tuberculorum patentium 5, tubo staminео basi affixa. *Stamina* corollae basi affixa, filamentis in tubum brevem connatis, antheris adscendentibus membrana suberecta appendiculatis. *Pollinia* in quoque loculo antherarum solitaria, adscendentia, subsemicircularia, margine recto pellucido. *Stylus* apice conicus, antherarum appendices superans. *Fructus* ignotus.

M. obcordata, *N. E. Brown*, species unica.

Frutex nanus vel suffrutex, ramosus, lactescens. *Rami* erecti, teretes, juniores adpresse puberuli, virides, demum glabri et cinerei. *Folia* opposita, firme vel subrigide coriacea, obcordata vel obovata, apice late emarginata vel truncata, basi cuneata, utrinque minute adpresse puberula ; petiolus 3–4 mm. longus ; lamina 1·8–3·2 cm. longa, 1·4–2·3 cm. lata ; stipulae minutissimae. *Cymae* laterales, ad nodos sessiles vel subsessiles, 4–9-florae. *Pedicelli* 2 mm. longi, minute puberuli. *Sepala* 1 mm. longa, ovata, obtusa, minute puberula. *Corolla* urceolato-tubulosa vel conico-tubulosa, basi 5-gibbosa, extra puberula, intra villosa, olivaceo-virens, lobis

rufescentibus ; tubus 6 mm. longus, basi 3 mm. diam., apice 1·75–2 mm. diam. ; lobi patentes, 1·5 mm. longi, 1 mm. lati, deltoideo-ovati, acuti. *Coronae* tuberculi carnosi, apice emarginati, dorso sulcati, lutei.

India. Without precise locality, *Micholitz*.

Described from a living plant cultivated in the Royal Botanic Gardens, Glasnevin, Dublin. It was obtained from Messrs. Sander & Sons, of St. Albans, who state that it was sent home by Micholitz when collecting in India and Burma. "It was probably received together with *Dendrobium regium*."

534. **Strychnos barbata**, *A. W. Hill* [Loganiaceae-Euloganieae] ; species *S. multifloro*, Benth., foliis triplinerviis et magnitudine florum similis, sed antheris minoribus basi barbatis et ovario ovoideo praecipue differt.

Folia elliptica vel obovato - elliptica, acuta vel acuminata, 8–13 cm. longa, 3·5–6 cm. lata, 5-nervia, triplinervia, nervis 3 principalibus plus minusve 1 cm. supra basin ortis, supra vernicosa, subtus nervis primariis distinctis venis transversis reticulatis inconspicuis instructa ; petioli plus minusve 0·5 mm. longi ; rami et petioli glabri. *Inflorescentia* laxe paniculata, axillaris, inferne glabra superne pedunculis et pedicellis minute hirsutis ; pedicelli 1–2 mm. longi ; bracteae triangulari-ovatae, marginibus hirsutis. *Flores* pentameri. *Calyx* 1 mm. longus, segmentibus orbiculari-ovatis obtusis margine hirsutis. *Corollae* tubus 2 mm. longus ; lobi 2·5 cm. longi, lineari-lanceolati, acuti, apicibus incurvis ; corolla intus longe hirsuta, basi glabra. *Stamina* filamentis paullo sub sinubus insertis 2 mm. longis ; antherae 1 mm. longae, basi barbatae. *Ovarium* orbiculari-ovoideum, 1·5 mm. longum, supra hirsutum ; stylus 2·5–3 mm. longus, paullo hirsutus ; stigma breviter clavatum. *Fructus* baccatus, globosus, immaturus.

New Guinea. Soron, Olandite, *Beccari*, 98.

Beccari's plants bearing the herbarium numbers 6656, 6656A from the Aru Islands may also belong to this species, but in the absence of flowers cannot be exactly determined.

535. **Strychnos cuspidata**, *A. W. Hill* [Loganiaceae-Euloganieae] ; *S. Ignatii*, Berg. ex Oliver, in Hook. Ic. Pl. t. 2212, similis foliis cuspidatis et corollae tubo breviore praecipue differt.

Folia elliptica, cuspidata, 12–16 cm. longa, 6–7·5 mm. lata ; cuspide 1·5–2 cm. longe producto, coriacea, supra vernicosa, trinervia, subtus nervis 3 prominentibus venis transversis plus minusve rectangularibus ; petioli plus minusve 1 cm. longi. *Inflorescentiae* pedunculatae multiflorae, axillares ; pedunculi et pedicelli pilosi ; pedicelli ad 1 mm. longi. *Flores* pentameri. *Calyx* 1 mm. longus, segmentis 0·75 mm. longis ovato-acutis, extra plus minusve pilosus. *Corolla* 8 mm. longa, linearia, 5-loba, lobis 2–3 mm. longis ellipticis ; tubus intus ad basin hirsutus. *Stamina* filamentis paullo sub sinubus insertis ; antherae oblongae, 1 mm. longae, 3-glandulosae. *Ovarium* ovoideum, 1 mm. longum ; stylus 6 mm. longus, stigmate capitato. *Fructus* baccatus, glaber, immaturus, 1·5 cm. diametro.

Borneo. Ragiato di Sarawak, Kuteing, *Beccari*, 1188, 1348.

A very distinct and striking species. The leaves are elliptical with a very regular outline and have a long apical cusp or drip tip. On the underside the three main veins form prominent ridges and the secondary connecting veins are arranged almost at right angles to the main nerves.

536. **Strychnos Forbesii**, *A. W. Hill* [Loganiaceae-Euloganieae]; a *S. laurina*, Wall. foliis latioribus ellipticis, inflorescentiis paniculatis, bracteis et floribus brevioribus differt.

Folia elliptica, 12–15 cm. longa, 6–8 cm. lata, 5–7 nervia plus minusve triplinervia, nervis marginalibus plus minusve inconspicuis, supra paullo vernicosa; petioli circiter 0·5 cm. longi, uti rami glabri. *Inflorescentiae* 1–3, axillares, pedunculis glabris vel parce pilosis 1–2·5 cm. longis 3–6 cymas gerentibus. *Cymae* 3-florae, pedunculis pilosis 0·5–1 cm. longis, pedicellis ad 1 mm. longis; bracteae lanceolatae, acutae, 3–5 mm. longae. *Flores* pentameri. *Calyx* plus minusve 1 mm. longus, segmentis late ovatis, 0·75 mm. longis subacutis marginibus pilosis. *Corollae* tubus 1·5–1·75 mm. longus, lobis 2 mm. longis elliptico-ovatis acutis, intus ad faucem annulatim hirsutus. *Stamina* filamentis 0·25 mm. longis; antherae apice glandulosae, 1 mm. longae, basi paullo barbatae. *Ovarium* globosum, 1 mm. diametro, supra parce hirsutum; stylus 1·5–2 mm. longus, infra parce hirsutus. *Fructus* ignotus.

New Guinea. Sogeri region, central position, 9° 28′ 45″ S. lat. 147° 31′ 37″ E. long., *H. O. Forbes*, 230.

537. **Strychnos ovata**, *A. W. Hill* [Loganiaceae-Euloganieae]; species distincta nulli arcte comparanda foliis ovatis trinerviis, floribus corollae lobis tubo duplo longioribus, ovario et stylo hirsuto.

Folia ovata, acuta, 6–8·5 cm. longa, 3·5–5 cm. lata, trinervia, supra vernicosa; petiolio 0·5 mm. longa. *Inflorescentia* paniculata, axillaris, pedunculis et pedicellis pubescentibus, plus minusve 4 cm. longa, 3 cm. lata. *Cymae* 3-florae, floribus lateralibus pedicellis 2–3 mm. longis instructis; bracteae late ovatae, acutae vel subacutae, 1–1·5 mm. longae, marginibus pubescentibus. *Flores* pentameri. *Calyx* 0·5–0·75 mm. longus, segmentis orbiculari-ovatis subacutis marginibus pubescentibus. *Corolla* extra parce pubescens; tubus 1 mm. longus, lobis 2 mm. longis intus basi hirsutis. *Stamina* filamentis 0·75–1 mm. longis; antherae 0·75–1 mm. longae. *Ovarium* ovoideum, supra hirsutum; stylus 1–1·5 mm. longus, infra parce hirsutus. *Fructus* ignotus.

Philippine Islands. Is. Paragua, *Vidal*, 3315.

538. **Matsumuria**, *Hemsl.* [Gesneraceae - Cyrtandreae]; genus novum ex affinitate *Klugiae* et *Rhynchoglossi*, ab ambobus corollae limbo fere regulari et seminibus linearibus utrinque cristatis differt.

Calyx subbilabiatus, fere a basi 5-partitus, lobis lanceolatis acuminatis leviter inaequalibus postico angustiore. *Corolla* anguste tubuloso - campanulata, leviter obliqua, basi leviter inflata, vix bilabiata, lobis 5 fere aequalibus brevibus rotundatis lateralibus exterioribus, anteriore intimo. *Stamina* perfecta 4, inclusa, fere aequilonga, ad corollae basin inserta, filamentis infra medium dilatatis, antheris magnis per paria conniventibus, loculis divergentibus; staminodium breve, filiforme. *Ovarium* 1-loculare, supra discum carnosum, pulviniformem sessile; placentae 2, bilamellatae,

lamellis utrinque multi-ovulatis ; stylus inclusus. *Capsula* lignosa, anguste ovoidea, calyce inclusa, longitudinaliter dehiscens. *Semina* numerosissima, minuta, linearia, utrinque cristata. *Herba* nana, perennis, caulescens, caulibus simplicibus. *Folia* alterna, petiolata, lanceolata. *Flores* mediocres in racemos terminales elongatos dispositi ; bracteae lineares, pedicellos breves aequantes.—*Rehmannia?* Hemsl. in Journ. Linn. Soc. vol. xxvi. p. 194 ; Matsumura and Hayata, Enum. Pl. Form. in Journ. Coll. Sc. Imp. Univ., Tokyo, vol. xxii. (1906), p. 281 ; Hayata, Fl. Mont. Form. in op. cit. vol. xxv. (1908), p. 174.

M. Oldhami, *Hemsl.*, species unica.

Herba hispidula, caulibus gracilibus adscendentibus 20–75 cm. altis. *Folia* longe petiolata, tenuia, oblongo-lanceolata vel ovata, saepius leviter obliqua, cum petiolo usque ad 25 cm. longa, utrinque attenuata, remote irregulariterque dentata. *Flores* flavi (*Henry*), circiter 4 cm. longi, in racemos densiusculos terminales 25–30 cm. longos subsecundos dispositi ; pedicelli calycem aequantes ; bracteae lineari-lanceolatae, acutae, pedicellos aequantes vel longiores. *Calyx* circiter 1 cm. longus, pilis 1–4-cellularibus apice glandulosis extus undique vestitus ; lobi acuti, apice glandulosi. *Corolla* circiter 4 cm. longa, puberula. *Capsula* calyce inclusa. *Semina* numerosissima, circiter 0·5 mm. longa.—*Rehmannia? Oldhami*, Hemsl. loc. cit.

Formosa. Famsui, *Oldham*, 400 ; between Kimpaoli and Pachena, very rare, growing on dripping rocks under the shade of coarse rank vegetation, *Hancock*, 4 ; summit of Ape's Hill, growing on side of vertical rocks in caves and darkish situations, *A. Henry*, 311, 1052.

This plant, originally described from incomplete material, was referred to *Rehmannia* (*Scrophulariaceae*), with some doubt because, as was then remarked, "the distinctly one-celled ovary pointed to the order *Gesneraceae*." Further material of the species, with ripe seeds and fruits, found among Mr. Henry's specimens, made it clear that the proper position of *Rehmannia? Oldhami* is in *Gesneraceae-Cyrtandreae*. Accordingly the plant has been renamed and referred to a new genus (*Matsumuria*) of this order, in compliment to Professor Matsumura, the distinguished Japanese botanist, who has done much to encourage the investigation of the Flora of Formosa.

539. **Ennealophus**, *N. E. Brown*, gen. nov. [Iridaceae-Moraceae] ; affinis *Tigridiae*, Ker, sed ramis styli tricristatis (nec bifidis et subulatis) valde differt.

Perianthii segmenta libera, inaequalia, late unguiculata ; exteriora unguibus patentibus, lamina reflexa ; interiora multo minora, unguibus incurvo-erectis, lamina reflexo-patente. *Stamina* 3 ; filamenta in tubum connata ; antherae ad apicem tubi subsessiles, patentes. *Stylus* ad apicem trifidus ; rami in cristas 3 oblongas fimbriato-dentatas divisi, duabus interioribus collateralibus erectis, tertia supra antheras patente, basi utrinque puncto stigmatico instructa.

E. amazonicus, *N. E. Brown*, species unica.

Bulbus 2·2 cm. longus, 1·3 cm. crassus, ovoideus, laevis, brunneus. *Caulis* 40–45 cm. altus, simplex, glaber. *Folia* 4,

subremota, 15–31 (supremum 5) cm. longa, 8–16 mm. lata lineari-lanceolata, subulato-acuminata, trinervia, plicata, glabra. *Spathae bracteae* 2, convolutae, acutae, 2 cm. longae, circa 6 flores circumdantes. *Pedicelli* 2·8–3·8 cm. longi, graciles, glabri. *Ovarium* 4 mm. longum, trigonum, glabrum. *Perianthium* 3·7 cm. diam., coeruleo-violaceum, unguibus pallide brunneis et segmentis interioribus ad basin laminae maculo albo triangulo ornatis, glabrum; segmenta exteriora 1·8–2 cm. longa, 1·7–1·8 cm. lata, sublate unguiculata, laminis cuneato-obovatis apice late rotundatis integris; segmenta interiora multo minora, latissime unguiculata, unguibus late cuneato-obovatis concavis basi patentibus deinde incurvo-erectis superne contiguis, laminis abrupte reflexo-patentibus 11 mm. longis 9–10 mm. latis obovatis apiculatis vel abrupte acutis basi contractis obsolete denticulatis. *Stamina* monadelphia; tubus 3 mm. longus, brunneus; antherae 4 mm. longae, patentissimae, sagittatae, loculis coeruleis. *Stylus* 3·5–4 mm. longus; rami 5 mm. longi, basi 4-alati, superne tricristati; cristae oblongae, fimbriatae, violacae, duae interiores erectae, tertia supra antheras patentissima utrinque cum puncto stigmatico ad basin disposito.

Brazil. Described from a living plant imported "from the Upper Amazon River" by Mr. H. A. Tracy of Twickenham.

This plant much resembles *Tigridia violacea*, Schiede (*Bot. Mag.* t. 7356), in appearance, size and colour of the flowers, but is entirely different from *Tigridia* and all other genera in the structure of its style-branches.

540. **Polypodium callophyllum**, *C. H. Wright* [Filices-Polypodiaceae]; species *P. trichomanoidi*, Sw., affinis, soris saepi bini dispositis differt.

Planta humilis. *Rhizoma* ascendens, gracile, sparsè pilosum. *Frondes* 6 cm. altae, 6 mm. latae, alte pinnatim lobatae, pilis albis 1–2 mm. longis undique vestitae, pallide virides, basi in stipitem brevem dense pilosum attenuatae; lobi oblongi, apice rotundati, basi inferiore decurrente; nervi laterales inconspicui, indivisi. *Sori* saepe bini alter ad basin, alter prope medium lobum affixi; sporangia pluria.

Perak: Gunong Hijan, 1070 m., on rocks, *Fleet-Surgeon C. G. Matthew, R.N.*

LII.—THE AMERICAN SPECIES OF MICROTROPIS.

T. A. Sprague.

The genus *Microtropis* (*Celastraceae*) was described for the first time in 1837 by Meissner (Gen. p. 68), and more fully by Arnott in 1839 (Ann. Nat. Hist. vol. iii. p. 152). At the end of 1896, 11 species were recognised, all of which were natives of the Indo-Malayan region. In 1897, however, Loesener described a new species of *Microtropis* from Costa Rica (Bot. Gaz. vol. xxiv. p. 393); and in 1900, another from Mexico (Engl. Jahrb. vol. xxix. p. 98). Three more American species are now added, bringing the total number of species to 16, five of which are natives of Mexico and Central America.

Discussing the problem presented by the distribution of *Microtropis*, Loesener (Engl. Jahrb. vol. xxiv. p. 198) suggested that the genus

might be polyphyletic, or, alternatively, that it originally inhabited a region far to the north of its present area of distribution, as is known to have been the case in numerous genera now confined to North America and the Chino-Japanese region.

The great similarity between the Central American *Microtropis occidentalis* and the Indian *M. discolor* renders a polyphyletic origin extremely improbable; whereas the montane character of *Microtropis*, and the wide distribution of many of the genera of *Celastraceae* favour the view that the area of the genus formerly extended further to the north.

Key to the American Species.

Pedicels filiform:—
- Pedicels about 2 mm. long; leaves drying brown, lateral nerves oblique, conspicuous on the lower surface, reticulation indistinct ... ... 1. *parviflora.*
- Pedicels about 5 mm. long; leaves drying grey, lateral nerves patulous, not conspicuous, reticulation distinct and very close ... ... 2. *filipes.*

Pedicels stoutish:—
- Cymes three or four times forked, many-flowered, branching divaricate ... ... 3. *Schiedeana.*
- Cymes once or twice forked, few-flowered, branching not divaricate:—
  - Leaves oblanceolate, 4–6 cm. long, coriaceous ... ... 4. *guatemalensis.*
  - Leaves elliptic, 7–11 cm. long, chartaceous 5. *occidentalis.*

1. **M. parviflora,** *Sprague*, comb. nov.——*Euonymus parviflorus*, Hemsl. Diagn. Pl. Nov. pars i. p. 6; Biol. Centr.-Amer., Bot., vol. i. p. 188.

Nicaragua. Chontales, *Tate*, 292.

The ovary was described doubtfully as 4-celled. It is, however, 2-celled, as in the other species of *Microtropis*.

2. **M. filipes,** *Sprague*, sp. nov.

Ramuli sub angulo acuto adscendentes, graciles, tetragoni, subalati, internodiis 1·5–3·5 cm. longis. *Folia* elliptica vel ovato-elliptica, apice breviter acutissime acuminata, basi obtuse cuneata, 3–7 cm. longa, 1·2–3·7 cm. lata, minute denticulato-serrata, chartacea, utrinque cinerea, margine leviter recurvo, nervo medio supra prominulo subtus prominente, lateralibus prominulis utrinque circiter 6 satis patulis, reticulatione venularum densa distincta; petioli 1·5–3 mm. longi. *Cymae* 1·5–3 cm. longae, ter vel quater furcatae, 15–31-florae, minute patenter puberulae; pedunculi filiformes 0·5–2 cm. longi; rami primarii 3–8 mm., secundarii 0·5 mm. longi, tertiarii obsoleti, ita ut pedicelli fasciculati videntur; pedicelli filiformes, 4–7 mm. longi; bracteae primariae subulatae, 1·5 m.m. longae, extra puberulae, secundariae et tertiariae primariis minores, pro rata latiores. *Flores* tetrameri, anthesi plena circiter 4·5 mm. diametro, pauci simul expansi. *Sepala* patula, transverse elliptica, vix 0·75 mm. longa et 1 mm. lata, extra densiuscule puberula. *Petala* patentia, suborbicularia, vix 2 mm. diametro. *Discus* inter

filamenta valde 4-lobus, 0·75 mm. diametro. *Filamenta* 0·3–0·4 mm. longa; antherae vix 0·2 mm. diametro. *Gynaecium* in toto circiter 0·4 mm. longum, ovario stylum aequante a disco occluso. *Fructus* rugosulus, 1 cm. longus (an immaturus ?).

Mexico. Tabasco, in inundated meadows by the river San Sebastian, *Rovirosa*, 264.

3. **M. Schiedeana**, Loes. in Engl. Jahrb. vol. xxix. p. 98.

Mexico. Vera Cruz: Chiconquiaco, between Misantla and Jalapa, *Schiede*.

4. **M. guatemalensis**, *Sprague*, sp. nov.—*M. occidentalis*, Donn. Sm. Enum. pars vi. p. 7, non Loes.

Ramuli satis robusti, brunneoli, teretes, juniores tetragoni, subalati, nitiduli, internodiis 0·5–2·5 cm. longis. *Folia* oblanceolata, apice obtusa, in basin cuneatim angustata, plerumque 4–6 cm. longa, 1·5–2·2 cm. lata, integra, coriacea, discolora, margine leviter recurvo, supra intense, subtus pallide brunnea, nervis medio excepto utrinque satis inconspicuis, nervo medio supra prominulo subtus prominente, lateralibus patentibus vel patulis utrinque circiter 7, venulis inconspicuis; petioli 4–5 mm. longi. *Cymae* 1–1·5 cm. longae, semel vel bis furcatae; pedunculi crassiusculi, subtetragoni, 4–6 mm. longi; rami primarii 2–3 mm. longi, secundarii 1 mm. longi, uniflori, apice bibracteati; pedicelli vix 1 mm. longi, infra medium articulati; bracteae semicymbiformes, 1–1·5 mm. longae, margine denticulato brunneo-purpureo. *Flores* tetrameri vel pentameri. *Torus* patelliformis. *Sepala* 2 exteriora 1·5 mm. longa, 2 mm. lata (explanata), brunneo-marginata, interiora duplo majora vel ultra, margine lacerato-ciliato. *Petala* suborbicularia, vix ultra 2 mm. diametro. *Discus* tetragonus vel pentagonus, 2 mm. diametro, ovarium haud occultans. *Filamenta* in angulis disci inserta, 0·5–0·6 mm. longa; antherae 0·3 mm. longae, 0·5 mm. latae. *Gynaecium* in toto 1·4–2 mm. longum, ovario 1–1·25 mm., stylo 0·5–0·75 mm. longo. *Fructus* ignotus.

Guatemala. Depart. Quiché: Chiul, 2600 m., *Heyde et Lux in Herb. Donnell Smith*, 3088.

5. **M. occidentalis**, Loes. in Bot. Gaz. vol. xxiv. p. 393; Engl. Jahrb. vol. xxix. p. 97.

Costa Rica. Prov. Alajuela: volcano Poas, 2700 m., *Donn. Smith*, 6470. Mexico. Vera Cruz: Cumbre del Obispo, between Papantla and Misantla, *Schiede* (ex Loes. l.c. 97).

LIII.—NEW ORCHIDS: DECADE 34.

331. **Pleurothallis attenuata**, *Rolfe*; inter species sectionis *Apodarum caespitosarum* sepalis et petalis attenuatis facile distinguenda.

Caules secundarii brevissimi, vaginis brunneis obtecti. *Folia* elliptica, minute tridenticulata, basi subattenuata, crassiuscula, 2·5–3 cm. longa, 6–10 mm. lata. *Scapi* graciles, 6–8 cm. longi, 2–4-flori. *Bracteae* tubuloso-spathaceae, apiculatae, 3–4 mm. longae. *Pedicelli* circiter 5 mm. longi. *Sepala* subconniventia, oblongo-linearia, subacuta, circiter 1·7 cm. longa. *Petala* lineari-lanceolata, subacuta, margine pubescentia et prope apicem revoluta, 1 cm. longa.

Labellum recurvum, oblongum, obtusum, minutissime crenulatum, 3–4 mm. longum, medio canaliculatum, prope apicem carinatum, carina papillis erectis instructa. *Columna* arcuata, 2 mm. longa, alis alatis.

HAB. unknown.

Flowered in the Royal Botanic Garden, Glasnevin, in August, 1892, and recently at Kew. The sepals and petals are light green, with a broad dull purple band at the base and a little purple marbling above ; the lip is greenish white. A shallow keel on the front of the lip is furnished with about ten erect papillae, a character not previously noticed in the group.

332. **Pleurothallis Birchenallii**, *Rolfe ;* a *P. insigni*, Rolfe, floribus multo brevioribus, labelli lobo intermedio lanceolato-oblongo margine copiose tuberculato-hispido differt.

Caules secundarii subgraciles, 4–9 cm. longi. *Folia* elliptico-oblonga, subobtusa, coriacea, 7–10 cm. longa, 2–3 cm. lata. *Scapi* subgraciles, circiter 12 cm. longi, 3–7-flori, basi spatha lanceolata 3 cm. longa obtecti. *Bracteae* tubuloso-spathaceae, acutae, 1 cm. longae. *Pedicelli* 2·5 cm. longi. *Sepalum* posticum lanceolatum, longissime caudato-acuminatum, 5 cm. longum ; sepala lateralia connata, lanceolato-oblonga, caudato-acuminata, 4·5 cm. longa, posticum duplo latius. *Petala* longissime caudato-acuminata, 3 cm. longa, basi latiora, utrinque dente acuto instructa. *Labellum* trilobum, 1 cm. longum ; lobi laterales erecti, falcato-lineares, obtusi, glabri, 6 mm. longi ; lobus intermedius lanceolato-oblongus, apice subacuminatus, margine copiose tuberculato-hispidus. *Columna* lata, 3 mm. longa.

COLOMBIA. Near Velez, *J. Birchenall.*

Flowered in April, 1909, with Mr. J. Birchenall, Alderley Edge, who collected it in the district named. The sepals are dull reddish purple, the dorsal margined with light green at the base, the petals light green striped with brown at the base, the side lobes of the lip greenish white, and the front lobe dull reddish purple.

333. **Bulbophyllum nudiscapum**, *Rolfe ;* a *B. barbigero*, Lindl., scapis elongatis et labelli capillis haud capitatis facile distinguendum.

Pseudobulbi tetragoni, late oblongi, 2–2·5 cm. longi, vaginis membranaceis ovatis striatis imbricatis vestiti, monophylli. *Folia* oblonga, subobtusa, coriacea, basi attenuata, 11–14 cm. longa, 3–4 cm. lata. *Scapi* elongati, 30–50 cm. longi, vaginis spathaceis paucis et distantibus vestiti ; racemi elongati, multiflori. *Bracteae* elliptico-oblongae, obtusae vel apiculatae, leviter carinatae, 6–9 mm. longae. *Pedicelli* 6–9 mm. longi. *Sepala* subconniventia, ovato-lanceolata, acuminata, circiter 1 cm. longa. *Petala* setacea, circiter 3·5 mm. longa. *Labellum* circiter 1 cm. longum, lineare, basi dilatatum et conduplicatum, apice longe stuposo-barbatum, pilis patentibus et 5–6 mm. longis. *Columna* lata, circiter 2 mm. longa, dentibus falcato-incurvis acuminatis.

TROP. AFRICA. Sierra Leone, *Afzelius.* Congo, *Mantin.*

Flowered in the collection of M. A. Imschoot, Mont-St.-Amand, Ghent, in August, 1895, and subsequently in several other collections. The sepals are green with dark brown markings at the base ; the copiously hairy lip is purple. The species is remarkable for its much elongated scape.

334. Eria ochracea, *Rolfe ;* affinis *E. ferrugineae*, Lindl., sed labelli lobis et cristis integris distincta.

Rhizoma validum, lignosum. *Pseudobulbi* cylindrici, 10–17 cm. longi, vaginis tubulosis imbricatis obtecti, apice 3–5-folii. *Folia* oblonga vel lanceolata-oblonga, subacuta, recurva, subcoriacea, 9–17 cm. longa, 2·5–4 cm. lata. *Scapi* terminales, pubescentes, circiter 10 cm. longi, basi vaginis oblongis obtecti. *Bracteae* patentes, ovato-oblongae, subacutae, 1–1·5 cm. longae. *Pedicelli* 2 cm. longi, pubescentes. *Sepalum* posticum ovato-oblongum, subobtusum, 1·5 cm. longum ; sepala lateralia oblique ovata, subobtusa, recurva, 1·5 cm. longa. *Petala* elliptico-oblonga, subobtusa, erecta, 1 cm. longa. *Labellum* mobile, 3-lobum, recurvum, 1 cm. longum ; lobi laterales angusti, truncati ; lobus intermedius suborbicularis, 7 mm. longus, apice revolutus ; discus carnosulus, laevis. *Columna* lata, circiter 5 mm. longa. *Mentum* obtusum, 6 mm. longum.

Malaya. *Curtis.*

Flowered at Kew in September, 1909. The flowers are greenish yellow, with a slight brownish suffusion and an indistinct brown line on the petals. The plant came out of a mixed lot of orchids which contained also *Dendrobium cruentum*, Reichb. f., and *Bulbophyllum fascinator*, Rolfe, so that the locality is presumably Siam.

335. Polystachya campyloglossa, *Rolfe ;* a *P. confusa*, Rolfe, omnibus partibus majoribus, labello valide recurvo et lobo intermedio angustiori distincta.

Pseudobulbi caespitosi, ovoidei, 2–2·5 cm. longi, vaginis membranaceis striatis vestiti, 2–3-phylli. *Folia* oblonga vel lineari-oblonga, minute apiculata, subcoriacea, 5–10 cm. longa, 8–15 mm. lata. *Scapi* erecti, subcompressi, pubescentes, circiter 5 cm. longi, uniflori vel pauciflori. *Bracteae* ovatae, acuminatae, carinatae, pubescentes, 5–7 mm. longae. *Pedicelli* 1 cm. longi, pubescentes. *Sepalum* posticum ovatum, acutum, concavum, puberulum, 1 cm. longum ; sepala lateralia late ovata, acuta, concava, obtuse carinata, puberula, 1·3 cm. longa, 1 cm. lata. *Petala* elliptico-lanceolata, subacuta, 8 mm. longa. *Labellum* trilobum, valide recurvum, 1 cm. longum ; lobi laterales erecti, rotundati, 4 mm. lati, intus glanduloso-puberuli ; lobus intermedius ovato-oblongus, subobtusus, subglaber, 5 mm. longus, basi transverse sulcatus ; discus glanduloso-puberulus, medio crassiusculus. *Columna* lata, 3 mm. longa, pede 6 mm. longo.

Trop. Africa. Mombassa.

Flowered with Messrs. Sander & Sons, St. Albans, in July, 1909. The flowers are green with a brown stain on the foot of the column and base of the lip. The specific name is given in allusion to the remarkably curved lip.

336. Stanhopea convoluta, *Rolfe ;* species *S. tricorni*, Lindl., affinis, differt floribus majoribus, mesochilii cornubus oblongis obtusis epichilio duplo brevioribus, nec acuminatis.

Pseudobulbi ovoidei vel ovoideo-oblongi, obscure 5-angulati, circiter 5 cm. longi. *Folia* petiolata, elliptica vel elliptico-oblonga, abrupte acuminata, 5–7-nervia, 30–35 cm. longa, 9–14 cm. lata, petioli circiter 8 cm. longi. *Scapi* breves, vaginis ovatis imbricatis obtecti, biflori. *Bracteae* spathaceae, elliptico-oblongae, subacutae, convolutae, 6 cm. longae. *Pedicelli* 7 cm. longi. *Sepala* subpatentia, elliptico-oblonga, concava, apice recurva et subacuta, 6·5–7 cm. longa, 3·5–4 cm. lata.

Petala conniventia, columnam involventia, ovata, concava, subacuta, 5 cm. longa, 3 cm. lata. *Labellum* trilobum, carnosissimum, 4 cm. longum ; hypochilium subglobosum, 2·2 cm. latum, basi utrinque angulatum vel cornu obtuso instructum, mesochilium breve, esulcatum, bicornutum, antice gibbosum, cornubus incurvis oblongis obtusis 1 cm. longis ; epichilium oblongum, truncatum, 2 cm. longum, 1 cm. latum. *Columna* incurva, 4 cm. longa, subito et late alata.

COLUMBIA. Prov. Antioquia, *Fl. Claes.*

Flowered in the establishment of M. Fl. Claes, Etterbeek, Brussels, in September, 1909. The sepals and petals are ivory white, with buff tips to the latter ; the lip is buff yellow with the interior of the sac orange.

337. **Mormodes revolutum,** *Rolfe ;* a *M. specioso*, Linden, labello margine valide revoluto et supra medium utrinque dente brevi instructo differt.

Pseudobulbi fusiformi-oblongi, 11–13 cm. longi, vaginis membranaceis striatis imbricatis vestiti. *Folia* elongato-lanceolata, acuta, 3–5-nervia, subcoriacea, 15–30 cm. longa, 3–3·5 cm. lata. *Scapi* axillares, circa 10 cm. longi, basi vaginis tubulosis vestiti, 4–6-flori. *Bracteae* ovato-oblongae, obtusae, 5–6 mm. longae. *Pedicelli* 4–5 cm. longi. *Sepala* oblongo-lanceolata, acuminata, apice et margine recurva, 3·5 cm. longa ; lateralia reflexa. *Petala* erecta, oblongo-lanceolata, acuminata, apice et margine recurva, 3·5 cm. longa. *Labellum* oblongum, 3·5 cm. longum, apice acutum et reflexum, margine valide revolutum et supra medium utrinque dente brevi instructum. *Columna* oblique incurva, acuta, 1·5 cm. longa.

PERU. Moyobamba.

Introduced by Messrs. Sander & Sons, and flowered in their nursery at St. Albans in July, 1909, a plant being afterwards acquired for Kew. The sepals and petals are deep buff yellow ; the lip is reddish brown. The specific name is given in allusion to the strongly revolute margins of the lip.

338. **Oncidium anfractum,** *Rolfe ;* ad *O. Reichenbachii*, Lindl., accedit, differt paniculae ramulis valde flexuosis, floribus minoribus et columnae alis late hastatis.

Pseudobulbi oblongi, compressi, paullo sulcati, apice et basi diphylli, 4–5 cm. longi, 2·5–3 cm. lati. *Folia* oblonga vel lineari-oblonga, subacuta, 13–22 cm. longa, 2–3 cm. lata. *Scapi* subgraciles, flexuosi, circa 1 m. longi, paniculati, paniculis angustis et ramulis brevibus retrofractis flexuosis. *Bracteae* ovato-oblongae, obtusae, 2 mm. longae. *Pedicelli* graciles, circiter 1·5 cm. longi. *Sepala* libera, reflexa, breviter unguiculata, lanceolata, undulata, apice acuta et recurva, 1 cm. longa. *Petala* sepalis paullo latiora, alioquin similia. *Labellum* late panduratum, 1·5 cm. longum ; lobi laterales late oblongi, obtusi, 5 mm. longi ; lobus intermedius subreniformis, obscure bilobus et crenulatus, 1·5 cm. latus ; crista basi quadrilamellata lamellis tridentatis apice dentibus tribus oblongis instructa. *Columna* subreflexa, 5 mm. longa, fronte biauriculata ; alae late triangulari-hastatae, subobtusae, 4 mm. longae. *O. Reichenbachii,* Lindl. Fol. Orch., Oncid. p. 49 (ex parte).

VENEZUELA. Prov. Merida: Laguneta, 2134 m. alt., *Funck & Schlim*, 1030.

A handsome species with long flexuose inflorescence and bright yellow flowers, with dark brown bars on the sepals and petals and lighter brown blotches on the basal half of the lip. It was confused by Lindley with his *O. Reichenbachii*, a species based on *O. maizaefolium*, Reichb. f. in Bonplandia, 1854, p. 279 (non Lindl.), and has long been known from the original dried specimen. It has now appeared in cultivation, having been sent for determination by Messrs. Hugh Low & Co. in July, 1908.

339. **Saccolabium (Calceolaria) platycalcaratum** *Rolfe;* a speciebus omnibus hujus sectionis calcare dorsaliter complanato differt.

Herba epiphytica, nana. *Folia* oblonga vel elliptico-oblonga, oblique et obscure bidenticulata, crasso-coriacea, 4–6 cm. longa, 1·5–2 cm. lata. *Scapi* axillares, 4–5 cm. longi; racemi breves, 6–9-flori, floribus subcorymbosis. *Bracteae* late ovato-oblongae, subobtusae, 2 mm. longae. *Pedicelli* 1–1·2 cm. longi. *Sepala* et *petala* patentia, elliptico-oblonga, subobtusa, 4–5 mm. longa, viridia, brunneo-maculata. *Labellum* trilobum, 6 mm. longum; lobi laterales lati, truncati, 1·5 mm. longi; lobus intermedius recurvus, suborbicularis, sagittatus, convexus, hirsutulus, albidulus, centro pulvino viridi instructus; calcar basi latum, apice dorsaliter complanatum, didymum, 3–4 mm. longum, apice 2–2·5 mm. latum. *Columna* lata, fere 2 mm. longa.

UPPER BURMA.

Sent for determination by Messrs. Sander & Sons, St. Albans, in February, 1909. A small-flowered species of the *Calceolaria* section, readily distinguished by the much flattened apex of the spur, though conforming to the group in other respects. The sepals and petals are yellow spotted with brown; the lip is whitish with the fleshy centre to the front lobe green.

340. **Acriopsis latifolia,** *Rolfe;* ab omnibus speciebus *Acriopsis* adhuc notis foliis late oblongis facile distinguenda.

Pseudobulbi aggregati, ovoidei, subcompressi vel obscure hexanguli, 2–4 cm. longi, novelli vaginis equitantibus obtecti, monophylli. *Folia* subsessilia, late oblonga, subobtusa, coriacea, nitida, supra canaliculata, 10–20 cm. longa, 3–5·5 cm. lata. *Scapus* lateralis, patens, simplex, circiter 10 cm. longus. *Bracteae* ovatae, subacutae, 2 mm. longae. *Pedicelli* 4 mm. longi. *Sepala* patentia, oblonga, subobtusa, subconcava, 6–7 mm. longa. *Petala* patentia, linearia, subacuta, 6–7 mm. longa. *Labellum* carnosum, 6–7 mm. longum; unguis cum columna in urceolum latum connatus, 3 mm. longus; lamina pandurato-oblonga, 4 mm. longa, apice biloba, basi lobis lateralibus falcato-oblongis biauriculata; discus dense papillosus et 4-callosus. *Columna* incurva, 5 mm. longa, superne ad latera stigmatis auriculis 2 oblongis incurvis instructa.

MALAYA.

A very distinct species, with leaves several times broader than those previously known. The flowers are very light whitish yellow, with red purple stripes and spots on the sepals and petals, and with papillae of similar colour on the disc of the lip. It flowered at Kew in April, 1909; it was received with a number of other species stated to have come from the Straits Settlements.

LIV.—ADDITIONS TO THE WILD FAUNA AND FLORA OF THE ROYAL BOTANIC GARDENS, KEW : X.

PHANEROGAMS.

Rubi.

R. A. Rolfe and A. B. Jackson.

Thirteen species of *Rubus* were recorded as indigenous to the Royal Botanic Gardens by the late Mr. G. Nicholson in 1906 (*Kew Bulletin*, Addl. Ser. V. pp. 78, 79). A study of the extensive thickets in the Queen's Cottage grounds made during August, 1908, convinced us that the list was not complete, and this led to a set of Rubi being collected and forwarded to the Rev. W. Moyle Rogers, the well-known authority on the genus and author of the Handbook of British Rubi. At his suggestion the search was continued during the present season, and a second set was forwarded to him, and his critical notes are here incorporated with our own.

It will be seen that seven additional forms have been obtained, without including two hybrids to be mentioned later, making an aggregate of 20 out of a total of 101 recognised as British in the Handbook; a very good proportion for so restricted an area. Two of those previously enumerated we have been unable to find, though in one case this probably arises through a change of name, but as no specimen has been found in the Herbarium the point cannot be cleared up. The work in such an intricate genus involved a re-comparison of the whole of the material, both in the grounds and the Herbarium, and as the previous conclusions were to some extent modified, we have included all the forms found, the additions being indicated by an asterisk.

There are two forms which neither Mr. Rogers nor ourselves have been able to identify, which are believed to be of hybrid origin, though we fail to find them among the numerous hybrids recorded by Focke and others. The subject is one on which much has been written, though the widest difference of opinion still exists among batologists. It is certain that some Rubi which have been described as species or varieties are natural hybrids, but no adequate method of testing the question has yet been found. The sterility of certain forms is often accepted as evidence of hybridity, but while probably a very good guide in itself it does not go far enough, for some hybrids which have been raised in gardens between very distinct species are fully fertile, and would be treated as species if found wild and their origin unknown. Such plants usually show unmistakable resemblances to both parents, and if their origin were unknown and the parents belonged to distinct groups, differences of opinion might arise as to which section they should be placed in. Analogous cases appear among British Rubi. Another fact is now known, namely that the offspring of hybrids when self-fertilised may revert more or less in the direction of either or both parents, so much as to obscure their common origin. The principle might be applied to testing the possible origin of certain fertile forms which show such perplexing resemblances to diverse species as to obscure their real affinity.

Certain it is that the British species of *Rubus* often grow intermixed or in close proximity, and that the pollen is widely distributed by numerous industrious bees, as may be observed on any sunny day. The intermediate character of many of the forms and the tendency to vary is notorious, so much so that in some cases it becomes difficult or even impossible to distinguish them. Further, the frequent occurrence of forms intermediate between well-marked species which happen to grow intermixed of itself suggests hybridity, and these intermediate forms often vary more than the well-defined species, and this often in the direction of one or the other of the supposed parents. It is now admitted that a large number of British willows formerly described as species are the result of the intercrossing of a comparatively small number of primary species, and it is not improbable that a similar condition of things obtains in *Rubus*, though the difficulty and intricacy of the subject delays its recognition.

The classification and nomenclature adopted are those of Mr. Rogers' Handbook of British Rubi (1900), and of his supplementary papers in the *Journal of Botany* (1909, pp. 310–318, 340–346). The numbers prefixed are those of the Handbook, and additions are indicated by an asterisk. "Hb. K." and "Arb. Hb." indicate that specimens are preserved in the General or the Arboretum Herbarium at Kew.

Subgenus Idaeobatus, *Focke*.

(1.) **Rubus Idaeus**, *L.* Nicholson records a few clumps in Queen's Cottage grounds, but these now seem to have disappeared: at all events we could not find any.

Subgenus Eubatus, *Focke*.

(Groups 1 and 2, **Suberecti** and **Subrhamnifolii**, appear to be absent.)

Group 3. Rhamnifolii.

(14.) **R. carpinifolius**, *Weihe & Nees*. Several bushes found in Queen's Cottage grounds, and showing a certain amount of variation. Hb. K., Arb. Hb.

(22.) **R. dumnoniensis**, *Bab.* Nicholson records this as here and there in Queen's Cottage grounds. We have only succeeded in finding a single bush on the towing-path side of the ha-ha, which Mr. Rogers considers to be correctly named. We have not seen a specimen of Nicholson's plant. Hb. K.

(23.) **R. pulcherrimus**, *Neum.* Abundant in Queen's Cottage grounds. Probably the commonest of the Kew brambles, and one of the handsomest when in flower. Aptly named. Hb. K., Arb. Hb.

Group 4. Villicaules.

(27.) ***R. gratus**, *Focke*, var. **sciaphilus**, *Lange*. Queen's Cottage grounds; not common. Of specimens collected in August, 1908, Mr. Rogers remarks: "Except for the stronger stem-prickles and

the nearly bald stem, these two sheets seem identical with Danish specimens of *R. sciaphilus*, Lange, now in my Herbarium. I have the same thing from 7 Western Counties (Welsh and English), but I have not seen it before from East England." Hb. K.

Group 5. **Discolores.**

(31.) ***R. Godroni**, *Lecoq. & Lamotte* (*R. argentatus*, P. J. Muell.). Collected in Queen's Cottage grounds in August, 1908, and a few bushes seen again this year. Mr. Rogers has confirmed the identification. There is a specimen in the Arboretum Herbarium, collected in Queen's Cottage grounds in 1899 and left unnamed, which is certainly identical. Hb. K., Arb. Hb.

(32.) **R. rusticanus**, *Merc.* Nicholson records this as occurring here and there by towing-path, where only we have found it. The double-flowered variety (var. *flore pleno*) occurs near Queen's Cottage, but only as a cultivated plant.

Group 6. **Sylvatici.**

(37.) **R. macrophyllus**, *Weihe & Nees.* Nicholson records this as abundant in Queen's Cottage grounds, but we have not come across any bush which can be assigned to any form of that variable species, nor can we find a dried specimen of it. The plant may possibly be included here under another name.

Group 7. **Vestiti.**

(43.) ***R. hypoleucus**, *Lefv. & Muell.* (*R. micans*, Gren. & Godr.). Found in several spots in Queen's Cottage grounds in August, 1908. Mr. Rogers remarks: "I think a highly glandular and aciculate form of this." Hb. K.

(47.) ***R. leucostachys**, *Schleich.* Here and there in Queen's Cottage grounds. A piece collected in August, 1909, was sent to Mr. Rogers, who marked it: "Probably *R. leucostachys* × *rusticanus*, though in panicle nearer to *R. leucostachys* than is usual in this hybrid." But we find quite identical forms under *R. leucostachys*, and as *R. rusticanus* is absent from the Queen's Cottage grounds we incline to call it simply *R. leucostachys*. Hb. K.

Group 8. **Egregii.**

(53.) **R. mucronatus**, *Blox.* Nicholson records this as not uncommon along borders of plantations in Queen's Cottage grounds, where we have also gathered it. A piece collected in August, 1909, and forwarded to Mr. Rogers was returned marked: "I suppose certainly a *mucronatus* form (*? f. umbrosa*) with foliage less hairy than usual, and exceptionally long petiolule to terminal leaflet." Hb. K.

(55.) ***R. anglosaxonicus**, *Gelert.* An unusually vigorous form was collected in the Queen's Cottage grounds in August, 1909, of which Mr. Rogers remarks: "The panicle is rather suggestive of a hybrid origin, but there seems little room for doubt that the stem pieces belong to *R. anglosaxonicus*." Hb. K.

Group 9. **Radulae.**

(61.) ***R. radula**, *Weihe*. A few bushes in the Queen's Cottage and Kew Palace grounds. In both cases Mr. Rogers agreed as to the determination, though suggesting that the latter showed an approach to *R. anglosaxonicus raduloides*, Rogers, in one direction and to *R. mutabilis*, Genev., in the other. Hb. K.

(62.) **R. echinatus**, *Lindl.* Fairly common and quite typical in Queen's Cottage grounds. One of our most distinct brambles and locally common. Hb. K.

(63.) **R. rudis**, *Weihe & Nees*. Common in open places in Queen's Cottage grounds, and found also on the strip by the side of the towing-path. Hb. K., Arb. Hb.

(66.) **R. podophyllus**, *P. J. Müll.* [or form between it and *R. oigocladus*, P. J. Müll. & Lefv.]. Queen's Cottage grounds. Nicholson records a form so named by Mr. Rogers, of which there is a specimen in the Arboretum Herbarium. We found an identical bush in August, 1908, and Mr. Rogers felt some doubt about the correct identification. Hb. K., Arb. Hb.

Group 10. **Sub-Koehleriani.**

(70.) ***R. Lejeunei**, *Weihe & Nees*, var. **ericetorum**, *Lefv.* A specimen collected in the Queen's Cottage grounds in August, 1908, was returned by Mr. Rogers with the remark: "Looks to me nearer to *R. ericetorum*, Lefv., than to *R. mucronatus*, Blox., but it seems rather peculiar and not in a very good condition for determination." Hb. K.

Group 11. **Sub-Bellardiani.**

(80.) **R. foliosus**, *Weihe & Nees*. Nicholson records this as common in shade in Queen's Cottage grounds, and there is a specimen in the Arboretum Herbarium. We found only a few examples of it in 1908 and none in 1909. Hb. K., Arb. Hb.

Group 12. **Koehleriani.**

(81.) **R. rosaceus**, *Weihe & Nees*, var. **hystrix**, *Moyle Rogers*. Very common in shady places. Mr. Rogers writes: "I know this form well, having seen a great deal of it since I first met with it in the Witley neighbourhood in 1890. It has long seemed to me curiously intermediate between *R. rosaceus* and *R. pallidus*, Weihe & Nees, and I agree with Mr. Marshall in considering it to be the common sand form of *R. rosaceus* throughout S.W. Surrey. It is especially abundant in the Haslemere district and the contiguous parts of S.W. Sussex and N. Hants. I have also seen it at Woburn, Beds." A very common and characteristic form at Kew, frequently with very narrow leaves. Hb. K., Arb. Hb.

(Group 13, **Bellardiani**, appears to be absent.)

Group 14. **Caesii.**

(101.) **R. caesius**, *L.* Nicholson records this as found on the strip by the side of the towing path, where only we have found it.

Hybrids.

A few bushes were found which we were unable to name, and these are considered to be hybrids of two distinct combinations. They are as follows :—

***R. mucronatus × pulcherrimus ?** Borders of thickets in Queen's Cottage grounds. Not rare. Specimens of three different bushes were collected in August, 1909, and sent to Mr. Rogers, and all were determined as above. We had referred them doubtfully to *R. mucronatus*, which on the whole it most resembles, and with which it was probably included by Nicholson. (We do not find this or the next recorded, either by the Rev. E. F. Linton [*Journ. Bot.*, 1907, pp. 271, 272] or by Focke [Asch. & Grabn. Syn. Mitt.-Eur. Fl. vi. pp. 440–648] where many hybrid *Rubi* are mentioned.) Hb. K.

***R. echinatus × rosaceus ?** A fine clump of a *Rubus* was found in a thicket in Queen's Cottage grounds in August, 1908, and was collected as *R. fuscoater*, Weihe ? Mr. Rogers replied : "Looks like a hybrid. Not *R. fuscoater*, Weihe." This year we collected abundant material, and sent it with the record that it grew associated with *R. rudis*, *R. rosaceus*, *R. pulcherrimus*, and *R. echinatus*. Mr. Rogers replied : "In all respects looks like a hybrid. The strong development of prickles and the barrenness of all the panicles especially point to such an origin, but I cannot suggest any parents." After a comparison with its associates we think *R. echinatus × rosaceus* the most likely combination. The resemblance to *R. rosaceus* is very marked, and except in its longer spines it may be described as fairly intermediate between the two. Hb. K.

Ranunculus auricomus, *L.* A large patch on the side of the path at the back of the Tropical Aroid House. Coll., W. B. Turrill.

Pimpinella magna, *L.* In quantity near the Herbarium. Coll., W. B. Turrill.

Atriplex hastata, *L.* Several plants in broken ground near Kew Palace. Coll., W. B. Turrill.

FUNGI : THIRD SERIES.

G. Massee.

The first addition to the list of *Fungi* occurring in the Royal Botanic Gardens was published in the *Kew Bulletin*, 1906, pp. 46, 47, and the second additional list appeared in the *Bulletin*, 1907, pp. 235–244. Since the last list the following new and additional species have been recorded.

Agaricaceae.

Lactarius, *Fries.*

L. scrobiculatus, *Scop.* On the ground. Q.

Marasmius, *Fries*.

M. Raffillii, *Massee*. *Pileus* primo campanulatus, dein applanato-expansus, margine subincurvus, laevissimus, crassiuscule membranaceus, glaberrimus, pallidissime sordideque flavo-griseus, medio ac super lamellas obscurior, 4–5 cm. diam. *Lamellae* pileo concolores, distantes, antice acutatae, postice attenuato-decurrentes, acie integrae. *Stipes* leviter excentricus, incurvus, tenuis, glaberrimus, tenax, pileo concolor. *Sporae* ellipsoideae, hyalinae, $5 \times 3\,\mu$.

On decaying staging in Stove, *C. P. Raffill*.

This species does not conform with European types of *Marasmius*, and is probably an introduced species.

Inocybe, *Fries*.

I. echinata, *Roth*. This fungus has long been known as occurring in hothouses, &c., in different European countries, and has always been considered as an alien. Quite recently it has appeared in quantity on the trunk of a fern just received from New Zealand, which may prove to be its native home.

Thelephoraceae.

Cyphella, *Fries*.

C. Berkeleyi, *Muss*. On dead sedge. A. (G. Nicholson.)

Tremellinaceae.

Exidia, *Fries*.

E. albida, *Bref*. On dead oak branch. A.

Gymnoascaceae.

Arachinotus, *Cohn*.

A. aureus, *Cohn*. On dead beech branch. A. (G. Nicholson.)

Sphaeriaceae.

Cucurbitaria, *Gray*.

C. elongata, *Grev*. On *Robinia hispida*. A.

C. bicolor, *Fckl*. On *Prunus sinensis* and *P. japonicus*. A.

Lophiostoma, *Ces. & De Not*.

C. ulicis, *Nke*. On gorse. A.

Diaporthe, *Nits*.

D. vepris, *Fckl*. On bramble. Q.

Rosellinia, *De Not*.

R. pulveracea, *Fckl*. Dead wood of *Crataegus*. Q.

R. liginaria, *Grev*. On furze. A.

Melanomma, *Fckl*.

M. nudum, *Sacc. & Speg*. On dead branches of *Tamarix tetrandra*. A.

Didymosphaeria, *Fckl*.

D. epidermidis, *Fckl*. Dead wood. Q.

Gibbera, *Fries*.

G. vaccinii, *Fries*. On dead branches of *Genista aetnensis*. A.

Hypocrea, *Fries*.

H. gelatinosa, *Fries*. Dead wood. Q.

Pleospora, *Rabenh*.

P. gymnocladi, *Baguis*. On *Gymnocladus canadensis*. A.

Gibberella, *Sacc*.

G. Saubinetii, *Sacc*. On dead twigs of *Gleditschia sinensis*. A.

Discomycetes.

Belonidium *Mont. & Dur*.

B. Jerdoni, *Berk*. On dead wood. A.

Dasyscypha, *Fries*.

D. leuconica, *Mass*. On dead stem of *Calluna*. A. (G. Nicholson.)

D. ascuna, *Mass*. On dead stem of *Calluna*. A. (G. Nicholson.)

D. ciliaris, *Sacc*. On barked wood of fallen beech. A.

Godronia, *Karsten*.

G. callunigena, *Karsten*. On dead stem of *Calluna*. A.

Echinella, *Sacc*.

E. setulosa, *Mass. & Crossl*. On dead stem of heather. A.

Cenangium, *Fries*.

C. abietis, *Rehm*. On dead wood of *Pinus montana*. A.

Orbilia, *Fries*.

O. succinea, *Quelet*. On a dead elder branch. A. (G. Nicholson.)

Deuteromycetes.

Phoma, *Fries*.

P. amorphae, *Sacc*. On *Amorpha fruticosa*. A.

P. melaena, *Mont*. On *Lychnis dioica*. Q.

Diplodia, *Fries*.

D. rhois, *Sacc*. On branches of *Rhus glabra*. A.

D. cercidis, *Ellis & Everh*. On *Cercis canadensis*. A

D. siliquastri, *West*. On *Cercis Siliquastrum*. A.

Diplodina, *West*.

D. malvae, *Togu*. On dead stem of *Sidalcea* sp. A.

Septoria, *Fries*.

S. tecomae, *Ellis & Everh*. On *Tecoma radicans*. A.

Pestalozzia, *De Not*.

P. funerea, *Lib*. On dead *Cryptomeria japonica*. A.

Chromosporium, *Corda*.

C. aureum, *Sacc.* On dead oak wood. A.

Chaetostroma, *Corda*.

C. atrum, *Sacc.* On rachis of *Cladrastis tinctoria*. A.

Septocylindrium, *Bon*.

S. Bonordeni, *Sacc.* On stem of *Vitis inconstans*. A.

Verticillium, *Nees*.

V. albidum, *Sacc.* On gorse. A.

V. quaternellum, *Grove*. On ripe blackberry. A.

Fusarium, *Link*.

F. album, *Sacc.* On old bast matting. A.

Bispora, *Corda*.

B. pusilla, *Sacc.* On old bast matting. A.

Periconia, *Bon*.

P. nigrella, *Sacc.* On dead beech branches. Q.

Hymenula, *Fries*.

H. Berkeleyi, *Sacc.* On fallen fir cones. Q.

LV.—DIAGNOSES AFRICANAE: XXXII.

1051. **Nemesia lilacina**, *N. E. Brown* [Scrophulariaceae-Hemimerideae]; affinis *N. parviflorae*, Benth., sed ramis numerosissimis, bracteis reflexis, floribus purpureo-lilacinis et capsulis oblongis valde diversa.

Herba annua, 20–37 cm. alta, profuse ramosa, corolla excepta ubique tenuiter et minute glanduloso-pubescens. *Rami* angulati, inferne subteretes, adscendentes vel subpatentes. *Folia* 2–3·5 cm. longa, 4–6 mm. lata, anguste lanceolata vel superiora lineari-lanceolata, acuta vel obtusa, dentata. *Racemi* 9–28 cm. longi, laxi. *Bracteae* reflexae, 2–5 mm. longae, sessiles, cordato-ovatae, acutae. *Pedicelli* patentes, graciles, 9–13 mm. longi. *Sepala* 2–2·5 mm. longa, oblonga vel lineari-oblonga, subacuta. *Corolla* (palato labii inferioris excepto) glabra; labium superius 3·5 mm. longum, 5–7 mm. latum, 4-lobum, lilacinum, atropurpureo-striatum, lobis oblongis, obtusis; labium inferius infra palatum reflexum, 3–4 mm. longum, 5–6 mm. latum, rotundatum, integrum, pallide purpureo-lilacinum, palato subtuberculato luteo-maculato; calcar 3–3·5 mm. longum, dorsaliter compressum, obtusum, albidum. *Capsula* 5–7 mm. longa, 3·5–4 mm. lata, oblonga, apice emarginata.

German South-West Africa. Hereroland; near Okahandya, *Dinter*.

Described from a living plant sent to Kew in August, 1909, by Messrs. Haage & Schmidt, who raised it from seed sent to them by Mr. Dinter in October, 1906.

1052. **Plectranthus Bolusii**, *T. Cooke* [Labiatae - Ocimoideae]. *Caules* erecti. *Verticilli* non-pedunculati 4–6-flori. *Corolla* 8·5 cm. longa ; tubus fere rectus.

Caules erecti, obtuse quadrangulares, simplices vel ramosi, foliosi, pilosi. *Folia* lata, ovata, acuta vel obtusa, viridia, supra sparse pilosa vel glabra, infra ad nervos pilosa, plus minusve irregulariter serrata, 2·5 cm. longa, 2 cm. lata ; petiolus 4–8 mm. longus. *Inflorescentia* in racemos terminales simplices vel paniculatos 10–15 cm. longos disposita ; verticilli 4–6-flori, fere 1 cm. distantes ; bracteae ovatae, acuminatae. *Pedicelli* vix 4 mm. longi, pubescentes. *Calyx* 4 mm. longus, coloratus, tubuloso-campanulatus, pubescens ; dens superior 1·5 mm. longus, 1 mm. latus, ovatus, acutus ; dentes 2 laterales breves, oblongi, obtusi, cuspidati ; dentes 2 infimi quam laterales multo longiores, lanceolato-subulati. *Calyx* (fructifer) fere 1 cm. longus, saepe coloratus, tubuloso-campanulatus, fere glaber. *Corolla* 8·5 mm. longa ; tubus 5 mm. longus, fere rectus, cylindricus ; labium superius 3 mm. longum et latum, apice rotundo crenulato ; labium inferius 3·5 mm. longum, 1·5 mm. latum, naviculare, acutum. *Stamina* inclusa.

South Africa. Transvaal ; Petersburg District near Potgeiter's Rust, 1100 m., *Bolus*, 11011 : Houtbosch, *Rehmann*, 6167.

This belongs to Sect. *Coleoides*, Benth.

A more robust fruiting specimen in Herb. Kew (the flowers of which are said by Wood to be purple) with larger leaves, from a hill near Weenen, Natal, 1200 m. (*Wood*, 4488), is probably a well-grown plant of this species.

1053. **Plectranthus Cooperi**, *T. Cooke* [Labiatae-Ocimoideae]. *Erecta. Folia* deltoideo-ovata. *Inflorescentia* in racemos longos disposita ; verticilli haud vel breviter pedunculati.

Planta erecta. *Caulis* obtuse quadrangularis, pubescens. *Folia* deltoideo-ovata, acuta vel acuminata, grosse et subirregulariter serrata, supra et ad nervos infra sparse pubescentia, ad 9 cm. longa et 7·5 cm. lata ; foliorum infimorum petiolus 5·5 cm. longus, foliorum superiorum brevior, plus minusve pubescens. *Inflorescentia* in racemos ad 25 cm. longos simplices vel paniculam formantes disposita ; rhachis scaberula, pilis glandulosis ; verticilli 6–12-flori, saepe fere 2·5 cm. distantes, non vel breviter pedunculati ; bracteae 2–3 mm. longae, glanduloso-pubescentes. *Calyx* (florifer) 2·5 mm. longus, coloratus, pubescens. *Calyx* (fructifer) 6 mm. longus, curvatus, fere glaber, saepe purpurascens ; dens superior fere 2·5 mm. longus, ovatus, acuminatus, erectus ; dentes caeteri e basi deltoidea subulati ; 2 dentes infimi quam laterales longiores. *Corolla* angusta, pars tubi basalis 1·5 mm. longa, 1 mm. lata, acute deflexa ; pars superior supra partem angustam fere cylindrica, dilatata, 5 mm. longa, 2 mm. lata, basi saccata ; labium superius 3 mm. longum ; labium inferius 4 mm. longum, fere 2 mm. latum, naviculare, acutum. *Stamina* exserta. *Nuculae* 1·5 mm. diametro, subglobosae, compressae, laeves, luteae.

S. Africa. Orange River Colony, *Cooper*, 2982. Natal, *Gerrard*, 1673 ; Byrne, in bush, 900 m., *Wood*, 1843. Zululand, *Gerrard*, 1673.

Belongs to Sect. *Coleoides*, Benth.

1054. **Plectranthus densiflorus,** *T. Cooke* [Labiatae-Ocimoideae]; *Plectanthro villoso*, T. Cooke, subsimilis, sed foliis orbicularibus petiolatis et corolla lutea (non lilacina) differt.

Suffrutex. Caules robusti, pubescentes. *Folia* 5 cm. longa et lata, orbicularia, obscure crenata et utrinque molliter villosa, basi cuneata, in petiolum brevem decurrentia. *Inflorescentia* paniculata, racemis spiciformibus 25 cm. longis dense villosis; verticilli multiflori, densi; bracteae ovato-lanceolatae, acutae, deciduae, 3 mm. longae, 1·5 mm. latae, a tergo pubescentes, marginibus ciliatis. *Pedicelli* 2 mm. longi. *Calyx* 2·5 cm. longus; dens superior 0·5 mm. latus; dentes caeteri 4 subaequales vel infimi minores, oblongi, ciliati. *Calyx* (fructifer) 4·5 mm. longus, campanulatus, rectus, villosus; dens superior 2·5 mm. longus, 2 mm. latus, ovato-oblongus, subacutus, ciliatus; dentes 2 laterales 3 mm. longi, ovato-oblongi, acuti, ciliati; dentes 2 inferiores similes sed minores. *Corolla* lutea (*Wood*); tubus 3 cm. longus, fere rectus, supra dilatatus. *Nuculae* fere 1 mm. longae, 0·5 mm. latae, laeves, nitidae, pallide brunneae.

S. Africa. Natal; near the Mooi River, 900–1200 m., *Wood*, 4475.

This belongs to Briquet's section *Stachyanthi*.
There is but one specimen in the Kew herbarium.

1055. **Plectranthus Peglerae,** *T. Cooke* [Labiatae-Ocimoideae]; *P. Galpinii*, Schlecht., affinis, sed foliis basi cuneatis, non cordatis vel truncatis, pedicellis longis, bracteis et calycis dente superiore differt.

Planta alta. *Caules* erecti, fere glabri, purpurei, sulcati. *Folia* late ovata, acuminata, grosse irregulariterque serrata, saepius superne glabra, inferne in nervis pubescentia et glandulis notata, basi cuneata, 7·5–20 cm. longa et ad 10 cm. lata; petiolus 2·5–7·5 cm. longus, glaber vel pubescens. *Inflorescentia* ad 30 cm. vel ultra longa, racemis simplicibus, laxe paniculatis; flores purpurei; verticilli 6-flori, 1–1·5 cm. distantes, non pedunculati; bracteae 3 mm. longae, ovato-lanceolatae. *Pedicelli* 8 mm. longi, filiformes. *Calyx* (frutescens) 8·5 mm. longus, curvatus, fere glaber; dens superior 1·5 mm. longus, ovatus, obtusus; dentes caeteri 4 subulati, 2 infimi quam laterales duplo longiores. *Corolla* 10 mm. longa; tubus parvus, superne infundibuliformis; labium inferius 5 mm. longum. *Stamina* exserta. *Nuculae* 2 mm. longae et basi 1·5 mm. latae, ovoideae, luteae.

S. Africa. Natal and Zululand, *Gerrard*, 1235; Transkei, Kentani, *Miss Pegler*, 377.

Belongs to Sect. *Coleoides*, Benth.

1056. **Plectranthus villosus,** *T. Cooke* non *Sieber* [Labiatae-Ocimoideae]; *P. marrubioidi*, Baker, facie subsimilis, sed calyce, cujus dens superior quam dentes inferiores duplo longior, omnino differt.

Suffrutex. Caules erecti, robusti, pubescentes. *Folia* sessilia, obovato-oblonga, obtusa, obscure crenata, utrinque dense villosa, basi cuneata, 2·5 cm. longa. *Inflorescentia* in racemos multos spiciformes paniculam formantes disposita; verticilli multiflori, villosi, densi; bracteae late ovatae, acutae, utrinque villosae, 6 mm.

longae et latae. *Pedicelli* fere 2 mm. longi. *Calyx* dense villosus, 2 mm. longus; dens superior quam caeteros duplo longior, 0·5 mm. latus, ovato-oblongus, subacutus, dense ciliatus; dentes caeteri 4 subaequales (vel 2 infimi minores), oblongi, quam dens superior multo breviores, dense ciliati. *Corolla* lilacina (fide *Wood*), 5 mm. longa, medio deflexa, supra flexuram dilatata; labium superius 1·5 mm. longum; labium inferius 2 mm. longum, 1 mm. latum, naviculare. *Stamina* superiora 1·5 mm. longa; stamina inferiora 3·5 mm. longa. *Stylus* 3·5 mm. longus. *Nuculae* 1 mm. longae et latae, angulares, pallide brunneae, laeves, nitidae.

S. Africa. Zululand; Entumeni, 600–900 m., *Wood*, 3955.

This belongs to Briquet's section *Stachyanthi*.

There is but one specimen in the Kew herbarium.

1057. **Plectranthus zuluensis**, *T. Cooke* [Labiatae-Ocimoideae]. *Caules* erecti. *Folia* parva, glabra. *Verticilli* non pedunculati, 4–6-flori. *Corollae* tubus rectus. *Pedicelli* 3 mm. longi.

Herba tenuis. *Caules* obtusi, quadrangulares, puberuli. *Folia* ovata, acuta, basi truncata vel breviter cuneata, fere glabra, marginibus regulariter serratis, 2·5–4 cm. longa et 2·5 cm. lata; petiolus 0·5–2 cm. longus, puberulus. *Racemus* terminalis, simplex, 6–11 cm. longus; verticilli 4–6-flori, 6–10 mm. distantes, non pedunculati; bracteae 3–4 mm. longae, obovatae, acuminatae. *Pedicelli* 3 mm. longi. *Calyx* 4 mm. longus, campanulatus, pubescens; dens superior 1 mm. longus, late ovatus, subacutus; dentes laterales 1 mm. longi, deltoidei, acuti; dentes 2 inferiores quam laterales duplo longiores, lanceolati, acuti. *Corollae* tubus fere rectus, subcylindricus, fere 6 mm. longus, supra partem angustam saccatus; labium superius 4 mm. longum et 3 mm. latum, 3-lobatum, obovatum, apice rotundum. *Stamina* exserta. *Nuculae* haud visae.

S. Africa. Natal and Zululand, *Gerrard*, 1675.

There are but two small pieces of this plant in the Kew herbarium.

Belongs to Sect. *Coleoides*, Benth.

1058. **Pogostemon Rogersii**, *N. E. Brown* [Labiatae-Satureineae]; species africana unica.

Herba erecta, 45 cm. alta, ramosa, corolla excepta ubique dense villoso-tomentosa, ramis adscendentibus. *Folia* deflexa, 1·5–2·5 cm. longa, 5–10 mm. lata, ovato-lanceolata vel oblongo-lanceolata, obtusa, basi rotundata, petiolo 2–3 mm. longo. *Spicae* 2–4 cm. longae, densae. *Bracteolae* filiformes, 3 mm. longae. *Calyx* campanulatus, 3 mm. longus, 5-nervis, aequaliter 5-dentatus, dentibus deltoideis acutis. *Corolla* exserta, roseo-purpurea; tubus 3–4 mm. longus, cylindricus; limbus subaequaliter 4-lobus, lobis 3 posticis ovatis obtusis in labium posticum 2 mm. longum approximatis, lobo antico 1·5 mm. longo ovato acuto integro. *Stamina* 4, aequalia, longe exserta, 5 mm. longa, apice decurva; filamenta medio longe barbata; antherae 1-loculares. *Discus* breviter columnaris, apice truncatus. *Stylus* apice bifidus.

Rhodesia. Dam near the railway, about 2114 miles from Cape Town, in water, 1300 m. alt., *Rogers*, 8314.

This is the first species of this genus to be recorded from Africa, and is quite distinct from all the Asiatic species.

1059. **Nepeta Wellmanii**, *C. H. Wright* [Labiatae-Nepeteae]; *N. robustae*, Hook. f., affinis, habitu laxiore et foliorum nervis pagina inferiore vix prominentibus differt.

Caulis erectus, lignosus. *Rami* ascendentes, virgati, dense tomentosi. *Folia* ovata vel ovato-rotundata, 2·5 cm. longa, 1·8 cm. lata, subacuta, basi rotundata, crenata, utrinque pilosa, infra punctato-glandulosa; nervi laterales utrinque circa 5, arcuati. *Cymae* plures ad ramorum apices in paniculam spicatam 2 cm. longam congestae. *Calyx* 6 mm. longus, tubulosus vel anguste campanulatus, extra sericeo-tomentosus; dentes subulati, tubo aequilongi, subaequales. *Corolla* extra hirsutus; tubus subcylindricus, 7 mm. longus; labium posticum erectum, concavum, obscure crenatum, 4 mm. longum; labium anticum patens, 4 mm. longum, lobus terminalis subacutus, lobi laterales rotundati. *Stamina* brevia, erecta. *Discus* crassus. *Nuculae* ellipticae.

Angola. Benguella; Bailundo District, 1500 m., *Dr. F. C. Wellman.*

1060. **Cleistanthus Johnsonii**, *Hutchinson* [Euphorbiaceae-Phyllantheae]; a speciebus africanis adhuc descriptis foliis non acuminatis differt.

Arbor magna. *Rami* leviter sulcati, glabri, cortice incano; ramuli juniores breviter pubescentes, innovationibus fere tomentosis. *Folia* oblonga vel oblongo-elliptica, apice obtusa vel rotundata, basi leviter rotundata, 2·5–6·5 cm. longa, 1·3–3 cm. lata, membranacea, utrinque glabra, nervis lateralibus utrinque 4–8 prominentibus; petioli rugosi, parce pubescentes, 5–7 mm. longi; stipulae deciduae. *Racemi* multiflori, floribus ♀ quam ♂ paucioribus plerumque inferne; pedicelli graciles, usque ad 2·5 cm. longi, puberuli. *Gemmae* ellipsoideae, obtusae, circiter 4 mm. longae, parce puberulae. *Flores* ♂ quam ♀ multo numerosiores: *Sepala* oblonga, apice leviter cucullata, subacuta, 4 mm. longa, extra puberula. *Petala* oblonga, fere teretia, 1 mm. longa. *Discus* glaber. *Filamenta* 2 mm. longa; antherae 3 mm. longae. *Ovarii rudimentum* parvum, glabrum, tripartitum, ramis intus concavis. *Flores* ♀ pauci; *Sepala* quam ♂ paulo longiora. *Petala* spathulata, apice dentata. *Discus* glaber. *Ovarium* subglobosum, 3 mm. diametro, glabrum; styli 3, breviter bifidi, glabri, lobis patulis. *Capsula* alte triloba, circiter 1·3 cm. longa, exocarpio crustaceo leviter rugoso glabro pallido, endocarpio corneo. *Semina* solitaria, ambitu irregularia, circiter 5 mm. diametro.

Tropical Africa. Portuguese East Africa; Sofala, large tree growing on the borders of mangrove swamps near the sea, *Johnson*, 26*b*.

Var. pubescens, *Hutchinson*; a typo ovario et fructibus junioribus dense flavo-pubescentibus differt.

In the same locality, *Johnson*, 26*a*.

The species and variety are remarkably similar, the latter differing only in the ovary and young fruit which are densely yellowish pubescent.

ZIZANIA AQUATICA.

[*To face page* 381.

LVI.—THE CANADIAN WILD RICE.

(*Zizania aquatica*, Linn.)

W. J. Bean.

Fringing the shallow margins of many of the lakes and rivers of Eastern North America is the remarkable grass yielding the grain commonly known there as "wild rice." For ages before the advent of Europeans it was, no doubt, an important item in the food supply of the North American aborigines, and even to-day, notwithstanding the numerous cereals that have been introduced, it is calculated that 30,000 of the North American Indians find in it their chief farinaceous food. It is an annual aquatic plant growing only in fresh water, and its habitats generally may be compared to those of the common reed (*Phragmites communis*) in Europe. It grows in similar dense fields, invading soft muddy bottoms where the depth of water does not exceed 2, or at most 3, feet. As seen under cultivation at Kew, it is a stately grass with stems standing 9 to 12 feet above the water when grown in good soil. The narrow, pointed leaves are 2 to 4 feet in length, 2 to 2½ inches wide about the middle, and of a deep, vivid green. In full blossom this grass is strikingly handsome, every stem being crowned with a large panicle of flowers 1½ to 2½ feet long, and about two-thirds as much wide. The male flowers are confined to the lower part of the panicle in graceful arching racemes, the females to the upper part on stiffer ones. Each panicle is borne on a naked, terete, erect, polished green stalk as long as the flowering portion, thus making it, stalk and all, 4 feet and upwards in length. Apart from any economic value it may possess in Great Britain, this plant is certainly worthy of cultivation for its beauty alone in shallow ponds and ornamental tanks. Some forms have panicles narrower in proportion to their length than those whose measurements are here given.

So remarkable and useful a plant naturally attracted the notice of early travellers. Peter Kalm, the Swede, who traversed a considerable part of Eastern North America between 1748 and 1751, mentions it several times in his "Travels"; and Jonathan Carver, who journeyed over part of the same country between 1766 and 1768, makes some interesting and quaint observations about it. He says that it is

> "the most valuable of all the spontaneous productions of that country. Exclusive of its utility as a supply of food for those of the human species who inhabit this part of the continent and obtain it without any other trouble than that of gathering it in, the sweetness and nutritious quality of it attracts an infinite number of wild fowl of every kind which flock from distant climes to enjoy this rare repast, and by it become inexpressibly fat and delicious."

Although the seed, or "rice," as prepared for food by the North American Indians is said to be highly esteemed by white men, and is, indeed, eaten as a "breakfast* cereal" in Minnesota and other

---

* Messrs. Brown and Scofield, in a useful article on the *Zizania* in Bulletin No. 50 of the U.S. Department of Agriculture, 1903, state that "the entire available supply of wild rice now sells at from two to three times the price of ordinary white rice."

States where the plant most abounds, it is on its use as a food-plant for duck and other edible wild fowl that its value as an economic plant chiefly depends. To-day, just as in Carver's time, myriads of birds migrate to the wild-rice fields at the ripening of the seed, there to feast and fatten gloriously for a few weeks.

The desirability, either from the point of view of food or that of sport, of establishing so valuable a plant in the fresh waters of the British Isles, and thereby augmenting the food supply of our native waterfowl, need not be emphasized. This is by no means the first time the idea has been mooted. In a paper on the *Zizania* read by Mr. A. B. Lambert before the Linnean Society, December 6, 1803, the author observes that "in a pond at Spring Grove [Isleworth] Sir Joseph Banks has a great quantity of this plant growing annually, ripening its seeds and sowing itself round the edges, and I am persuaded that it might be sown with some advantage where no other grain will grow in many shallow pieces of water in Great Britain and Ireland, especially in the latter country." (Transactions of the Linnean Society, vol. vii., p. 264, fig. 13.) Whether any attempt was ever made to carry out this idea is not stated, but if so, it would not appear to have been permanently successful, for, in course of time, *Zizania aquatica* quite disappeared from cultivation in the British Isles. It was re-introduced about 12 years ago to Kew, where it has since been cultivated, but merely as an interesting and ornamental plant. Shortly thereafter a sustained attempt at its introduction was undertaken by Lord Walsingham.

It has been thought worth while to attempt its acclimatisation in the most likely parts of Great Britain and Ireland, and for this purpose Kew has recently imported from Canada and distributed a considerable quantity of seeds. Among those who have kindly consented to assist the establishment by co-operating in this attempt have been the following :—

Mr. H. C. Baker, Oaklands, Almondsbury, Bristol.
Rev. M. C. H. Bird, Brunstead Rectory, Stalham, Norfolk.
Mr. J. Bonhote, Gadespring, Hemel Hempstead, Herts.
Mr. C. J. Cookson, Trelissick, Truro.
Mr. H. Harmsworth, Horsey Hall, Great Yarmouth.
Lord Iveagh, Elvedon Hall, Thetford, Suffolk.
Mr. E. Kay Robinson, Warham, Norfolk.
Mr. T. A. Dorrien-Smith, Tresco Abbey, Isles of Scilly.
Mr. W. Smith, Hill House, Surlingham, Norwich.
Lady Smythe, Ashton Court, Bristol.
Mr. W. F. Tremayne, Carclew, Perranarworthal, Cornwall.
Sir A. P. Vivian, Bosahan, St. Martin, Cornwall.
Lord Walsingham, Merton Hall, Thetford, Suffolk.
Mr. J. C. Williams, Caerhays Castle, St. Austell, Cornwall.
Mr. J. H. Buchanan, Leny, Callender, Perthshire.
Sir J. Gladstone, Bart., Fasque, Laurencekirk, Kincardineshire.
Mr. D. J. Macpherson, Glentrium, Newtonmore, Invernessshire.
Rev. J. E. Macrae, Lochinver, Lairg, Sutherlandshire.
Lord Barrymore, Fota, Co. Cork.
Earl of Kenmare, Killarney House, Co. Kerry.
Marquis of Lansdowne, Derreen, Co. Kerry.
Col. Davis Cooke, Colomendy, Mold, Flintshire.
Miss Talbot, Margam Park, Port Talbot, Glamorgan.

Cultivation.

The *Zizania* presents not the least difficulty in its cultivation when once its requirements are known. The most important particular is the preservation of the seed during winter. It is absolutely essential that *it should be kept moist*. In a state of nature the seed falls into the water when ripe and sinks at once (or very shortly) to the bottom, there to remain throughout the winter and until it germinates the following spring. Kept dry, its vitality rapidly decreases. Sir Joseph Banks failed several times to introduce the seed alive in a dry state, but at last succeeded when some was sent to him from Canada in jars of water. Ninety years later, his experiences had passed out of mind, and dry seed was again several times sent to Kew from North America, which invariably failed to germinate. Finally, a consignment of young plants packed in wet moss was received and they grew freely. The seed of the plants grown at Kew is now gathered when ripe, at once immersed in water and kept there throughout the winter either in a jar, or tied up loosely in canvas. As the seed is heavier than water, and sinks naturally, it may be kept in an open vessel. For reasons of convenience and safety the seed is usually kept under cover, either in the tank of a cool house, where in the ordinary course of work the water is continually being changed, or in an outhouse where the water is changed once or twice a week. But a pond or tank out-of-doors would do equally well. It does not apparently matter how cold the storing place is. It has been found in North America that seeds kept through the winter in water frozen into a solid block of ice part of the time, germinated quite well.

Whilst it is undoubtedly the safest method to keep the seed permanently immersed throughout the winter, it can, apparently, be kept in air for a week or two without losing its vitality entirely. Some seed was imported from Canada in May, 1909, which we were informed had been kept damp from the time it was collected. It was packed for transmission in such a way as to retain moisture, and some of the seed which was sown on arrival germinated very well. The rest was spread out to dry and a fortnight later a second batch was sown. The percentage of germination was then found to have decreased by about two-thirds. A third batch was sown two weeks later (or a month after arrival), and not one seed germinated. Of seed gathered at Kew and stored in water, from 90 to 95 per cent. germinate.

The mode of raising the plants at Kew is as follows :—About the middle of March seed is sown in $2\frac{1}{2}$-inch pots of loamy soil (two seeds to each pot in case of one failing), the seed being barely covered with soil. The pots are immersed in pans of water deep enough to cover them, and placed in a cool greenhouse. By the middle of May the plants, having been once repotted, are eight to twelve inches high and they are then planted, about 1 foot apart in rich soil, at one corner of the Lily Pond (*see* illustration), the soil being from 4 to 8 inches below the surface of the water. Beyond protecting the plants by wire-netting from waterfowl (which are very fond of the fresh young leaves) no further attention is needed until the ripe seed has once more to be gathered. When planted

thinly a single plant will develop a "stool" of twenty or more flowering stems. The seeds are sown in pots merely for convenience in handling. Where large numbers were dealt with, it would be simpler and better to sow them in shallow boxes of soil plunged in water.

Whether *Zizania aquatica* is capable of establishing itself permanently in the British Isles is uncertain. From time to time surplus plants have been planted on the banks of the lake and in the ha-ha which separates the Kew Arboretum and the Queen's Cottage Grounds from the banks of the Thames, and left to take their chance; yet although they have often grown and flowered well, I have never seen a single plant the following season. Still, circumstances at Kew are not favourable for an experiment of this kind. The lake and the ha-ha are emptied of water and more or less cleaned every winter, and unless protected, both the seeds and young seedlings are exposed to the attentions of the ornamental water-fowl. But even in the Lily Pond, where the plants have been watched and guarded, our experience has not been particularly encouraging, for when left to itself the *Zizania* has rarely survived more than two seasons. A considerable quantity of ungathered seeds fall into the water every autumn, which germinate freely enough the following spring, but so late are they and so slowly do the plants grow in the early stages that they appear to be unable to produce good seed, except after unusually long and warm summers. It is for this reason that we find it necessary to raise young plants under cover, and to hasten them through their early stages as described above. Lord Walsingham, who has grown the *Zizania* at Merton Hall, Thetford, in Suffolk, for some years, informs us that his experience in this respect is similar.

There are, of course, many places where the conditions are more favourable than at Kew, and where an experiment in acclimatising this plant can be carried out on a sufficiently large scale. Its capabilities in this respect can only be definitely ascertained when this is done. Mr. Lambert, in 1803, suggested Ireland as a likely place for its naturalization, and there are undoubtedly many spots on the margins of the western lakes, and in the backwaters of the rivers, where the soil and depth of water are perfectly suited for the *Zizania*. There remains, however, the important factor of climate, and especially sunshine. The plant grows naturally where the winters are severe and the summers very hot. Our winter conditions are quite favourable; for the seeds, as has already been stated, can pass through the winter months embedded in ice. It is in the lack of summer heat that the difficulty will probably be found to lie.

Judging by the behaviour of this plant at Kew it ought to thrive in the marshes and broads of Norfolk and Cambridgeshire. There are also suitable conditions in the wet lowlands of Kerry, particularly the Killarney districts. An excellent place for experiments with this plant is the Isle of Wight, where in the lowlands between Sandown, Brading and Bembridge on the east, and in the upper reaches of the Medina river, there are large areas of shallow water over mud which would afford suitable

conditions for a water-loving annual grass. Sunny areas should be chosen, and the larger they are the better will be the chances of success.

The depredations of water-fowl and perhaps water-rats may have to be guarded against, and for safety's sake a quantity of seeds should be gathered each autumn and kept immersed in water until sowing time.

The Rev. M. C. H. Bird, Brunstead Rectory, Stalham, Norfolk, reports that he has made several attempts to establish Canadian Rice in the broads and dykes of Norfolk, but either the seeds were devoured by water voles, or the young plants were worried by aquatic birds.

The only wild bird at Kew that appears to have discovered the value of the *Zizania* seeds as a food is the sparrow. I have frequently disturbed a flock of perhaps twenty of them feeding on the seeds of the group of plants here illustrated. But, according to Lord Walsingham's experience, ducks also, when they find the fallen seed, eat it greedily.

Our illustration is from a photograph of a group of plants of *Zizania aquatica* growing at the edge of the Lily pond in the Royal Botanic Gardens, Kew.

LVII.—THE MANCHURIAN WATER-RICE.

(*Zizania latifolia*, Turcz.)

Otto Stapf.

With *Zizania aquatica*, L., the American Wild Rice or 'Water-Rice,' another grass, of Asiatic origin, is very frequently confounded. It has for some time been in cultivation at Kew and in a few places on the Continent as *Hydropyrum latifolium*.

The grass in question was first mentioned—by name only—as a distinct species by Turczaninow in his "Catalogus plantarum in Regionibus Baicalensibus et Dahuria sponte Crescentium" (in *Bull. Soc. Imp. Nat. Mosc.* 1838, No. 1, p. 105) in 1838, he having found it five years previously in lakes between the rivers Shilka and Argun in Eastern Siberia. The name given in the Catalogue is '*Zizania latifolia*'; but the specimens of Turczaninow's collection were distributed as '*Limnochloa caduciflora*, Turcz.,' and it was under this latter name that Trinius referred to the grass in his paper on the *Oryzeae* (in *Mém. Acad. St. Pétersb.* sér. vi. vol. v. Bot. p. 185). Whilst admitting that the Siberian plant differed in certain particulars from the American *Zizania aquatica*—or as he called it *Hydropyrum esculentum*—viz. in the fimbriate ligule, the awned male spikelets and the slender pedicels of the female spikelets, he was not certain whether these differences were sufficient to entitle the Siberian grass to rank as a distinct species. On the other hand Grisebach, who was the next to deal with it (in *Ledebour, Flora Rossica*, vol. iv. p. 466), described it as *Hydropyrum latifolium*, distinguishing it from its American congener by the awned male spikelets. Steudel also described it as a distinct species under the name of *Zizania dahurica*, and Turczaninow himself in

his Flora Baicalensi-Dahurica (vol. ii. part i., pp. 289, 290), insisted on its distinctness. Maximowicz (*Primit. Fl. Amur.*, p. 327) and Regel (*Tent. Fl. Ussur.*, p. 171) also followed Grisebach, and so did most later writers, until Bentham (in *Bentham and Hooker*, *Genera Plantarum*, vol. iii., p. 1115) expressed the opinion that *Zizania latifolia*, Turcz., and *Z. aquatica*, L., do not differ. He emphasised this view in his 'Notes on Gramineae' (in *Journ. Linn. Soc.* vol. xix., p. 54) by saying that "the typical *Z. aquatica*, Linn. . . . includes the East-Russian and Japanese *Z. latifolia*, which is absolutely identical with some North-American specimens." Hackel (in *Engl. & Prantl*, *Nat. Pflanzenf.* vol. ii., part ii., pp. 40, 41) also admits only one species in *Zizania*, i.e. *Z. aquatica*, adding that the Asiatic form is a mere variety. The 'Index Kewensis,' the 'Index Florae Sinensis' (Rendle in *Journ. Linn. Soc.* vol. xxxvi., p. 345), and recent Japanese floras (e.g. *Matsumura*, *Ind. Plant. Japon.* vol. ii., p. 87) all enumerate the Asiatic 'Water-Rice' simply as *Zizania aquatica*. It is, however, noteworthy that all those who have seen the two grasses in the wild state, or have had practical experience of them under cultivation, look upon them as distinct plants. Hance, who published a paper on the Asiatic 'Water-Rice' in the Journal of Botany for 1872 (p. 146), and Paillieux and Bois in their valuable 'Potager d'un Curieux' (p. 89), treat the Asiatic grass as a distinct species, and the former gives specific reasons for doing so. Korshinsky, who collected it himself on the Amur, follows Grisebach; and Komarow although he enumerates it as *Zizania aquatica* var. *latifolia* (*Flor. Mandshur.* vol. i., pp. 261, 262) insists upon its structural distinctness and its geographical isolation.

It is no doubt justifiable theoretically to reduce the two Water-Rice grasses to a common ideal type, but as we know them in their present state and for practical purposes they certainly represent two perfectly distinct forms, which we may conveniently designate 'species.'

Hance, who knew the Asiatic water-rice well in the living state, has given a fairly good account of the characters wherein this grass differs from its American congener; but as his paper has been little noticed, it may be useful to point out these differences once more and more fully.

Innovation and duration.—It is well known that *Z. aquatica* is an annual even under conditions which would seem to favour a prolonged duration. The young plant early develops vegetative buds in the axils of the basal leaves which grow up intra-vaginally into leaf-bearing culms. All or most of the culms of a bunch flower towards the end of the summer, mature their seeds in the autumn, and then die down. The juvenile state of *Z. latifolia* is not known; but in the adult state it is characterized by the presence of stolons which persist as rhizomes. The latter are described by Hance as being "as thick as a swan's quill, or of even twice that diameter. These rhizomes run to some length, and are clothed at the nodes, where they put forth stout fibres, with three ovate-lanceolate tough membranous semi-transparent scales,* embracing their entire

* These scales can hardly be called 'tough'; they are rather thin and split readily, which probably misled Hance into stating that there are three of them in association with each node.

circumference, those nearest the collum being about an inch long." In the few specimens taken up at Kew, the rhizomes were about 1 cm. in diameter and up to 8 cm. long. The stolons (at the end of October) were rather more slender and somewhat shorter, with numerous crowded scales at their tips and small vegetative buds in the scale axils. These stolon-tips would in the next season grow into bunches of leaf-shoots and throw out from their base other stolons. The stolons appear to persist as rhizomes through several seasons, connecting the leaf bunches which have sprung from them. There is no doubt that the stolons and rhizomes often grow much larger. There is, for instance, a stolon in one of Turczaninow's specimens quite 15 cm. long, although the tip is broken off, and Balansa describes the rhizomes of the Tonkin specimens as 'long and stout.' A copious supply of roots is developed from the nodes of the rhizomes as well as from those of the base of the shoots, some of them attaining 2–3 mm. in diameter and usually densely clothed with root fibres.

Culms.—Turczaninow describes the culms of *Z. latifolia* as "orgyales" and taller than those of *Z. aquatica*; but the latter also attain to similar dimensions, although there occur forms which are not higher than 40–50 cm. The internodes of the underground and overground stems of *Z. latifolia* are hollow and divided into chambers by numerous thin diaphragms. Similar diaphragms are also found in the culms of *Z. aquatica*, but they are more delicate and often break down.

Leaves.—There is little difference in the shape and size of the leaves of *Z. latifolia* and of robust states of *Z. aquatica*, the blades of the latter attaining up to 6 cm. in width. In fact, the only palpable differential character as regards the leaves of the two is connected with the ligule. This is firmer and longer in *Z. latifolia*, and ciliolate along the margins. It might be described as ovate-acuminate with a bifid tip and up to 2·5 cm. long, whilst the ligule of *Z. aquatica* is more delicate, particularly in the upper hyaline portion, and therefore becomes soon lacerated. It is also more bluntly rounded off and shorter.

Inflorescence and Distribution of Sexes.—It is well known that in *Z. aquatica* the two sexes are distinctly separated, the male spikelets being confined to the lower pseudowhorls of the panicle, and the female to the upper. Moreover, during flowering, the male branches spread horizontally, while the female part of the panicle is more or less contracted, the branches being erect (the uppermost) or obliquely erect. After flowering the branches remain in this position, or the female become rather more oblique. This is, however, only true of the flowering panicle on the living plant. If cut and allowed to dry up, the panicle contracts rapidly, and particularly the female branches erect themselves so as to be closely adpressed to the main axis. Such states are commonly seen in herbaria. In *Z. latifolia* the tendency towards a similar separation of sexes is manifest, but it does not assert itself to the same degree. The lower pseudowhorls, it is true, bear male spikelets, but the upper have male and female spikelets with a preponderance of the latter which occupy the middle and upper parts of the

branches. Occasionally female spikelets also terminate the otherwise male branches of the lower whorls. As to the direction of the branches, the herbarium specimens, if cut from flowering or fruiting plants in their early stages when the joint cushions at the base of the branches are still active, cannot be relied upon. Such panicles are in fact as much contracted as similar panicles of *Z. aquatica*. But Turczaninow and Hance state from observation in the field that the lower branches of *Z. latifolia* are spreading (patentes). They do not, however, appear to remain so as the panicle matures. At least, a specimen collected by Balansa (*Pl. de Tonkin*, no. 4727) in the fruiting state has all the branches suberect or (the uppermost) erect. Turczaninow has remarked the fact that the pedicels of the female spikelets of *Z. latifolia* are much more slender than those of *Z. aquatica*. This is indeed one of the most conspicuous differential characters. He might have added, that the reverse is the case with respect to the pedicels of the male spikelets, which in *Z. aquatica* often are almost capillary. In other words, the differentiation of the male and female pedicels is much more accentuated in *Z. aquatica* than in *Z. latifolia*. This is particularly noticeable if the clavate tips of the pedicels be compared.

Spikelet.—The tips of the pedicels of both sexes and in both species terminate in a membranous cupula, the homologue of the two basal glumes which in *Oryzeae* tend so generally towards extreme reduction or complete suppression. In *Z. aquatica* this cupula is perfectly glabrous; in *Z. latifolia*, however, it is minutely ciliolate and puberulous on the back. The same difference is repeated in the following pair of glumes which in an equally reduced condition surround the base of the deciduous part of the spikelet. Grisebach's phrase, "callus (sc. spiculae) membranula in cilia fere ad basin soluta cingitur," refers to it. In the female spikelet this 'membranula' consists of two distinct membranous ciliate truncate scales, whilst in the male it is only indicated by a narrow sparingly hairy rim; in *Z. aquatica* on the other hand it is perfectly glabrous in both sexes. The fifth (fertile) glume and its valve are, sex for sex, very similar in both species except for the fact that the male spikelets of *Z. latifolia* are generally more or less awned, the bristle-like awn varying from one-fifth to the full-length of its glume; rarely it is reduced to a mere cusp. In *Z. aquatica* it is usually absent, the glume ending with an acute point; but in some specimens it is found to be drawn out into a fine, bristle-like mucro. Not much stress should therefore be laid on this feature taken by itself. The lodicules, stamens, and pistils of both species fail to afford any character that may be relied on for discrimination. Hermaphrodite spikelets occasionally occur in both species.

Grains.—The only grains which I have seen of *Z. latifolia* are those of Balansa's specimen (*Pl. de Tonkin*, no. 4727). They are linear oblong and 5 by 1 mm. If this should prove to be their normal condition, they would indeed be easily distinguishable from the slender linear, long (9–15 mm.) grains of *Z. aquatica*.

Distribution.—*Z. latifolia* seems to have its home in Manchuria from the Amur to Korea and eastwards to Japan. It is also recorded from the neighbourhood of Pekin, but whether it occurs

there or in any part of China proper in the wild state is uncertain. Bretschneider (in *Paillieux et Bois*, l.c., p. 90) says it is grown at Pekin as a vegetable, and (*Bot. Sin.*, ii., p. 159) cultivated throughout China for its stalks ; but Hance, who received specimens collected near Pekin from Swinhoe, mentions that locality as if it were in the natural area of the plant. He also says that it is cultivated on the Yantse Kiang and occurs in South China in that state only. On the other hand, Su sung, the author of an illustrated Chinese Materia Medica of the 11th century, states, according to Bretschneider (*Bot. Sin.*, iii., p. 351), that it is common in rivers, lakes and swamps, and especially refers to the marshes of Che Kiang. The Rh ya i (an appendix, probably of the 13th century, to the Rh ya, a dictionary of terms) also mentions the marshes of Che Kiang as a station of the grass, adding that it affords excellent fodder for horses. In Formosa, it exists, according to A. Henry (*Trans. As. Soc. Japan*, vol. xxiv., suppl. p. 107), only in the cultivated state, and its occurrence in Tonkin (*Balansa, in Journ. de Bot.*, vol. iv., p. 161) on the banks of the Grand Lac of Hanoi, and in the Shan States (Abdul Khalil in Herb. Kew.), is also due to cultivation, and possibly subsequent establishment in a subspontaneous state.

Cultivation.—*Zizania latifolia*, has been in cultivation in China as a vegetable for a very long time. Bretschneider (*Bot. Sin.*, part iii., 1893, p. 350, 351) traces its use in that form back to the 10th century. Its Pekin name, according to the same authority, is Kiao paï tsaï (Kiao cabbage) or Kiao sun (Kiao shoots). Simon (in *Paillieux & Bois, Potager d'un Curieux*, p. 93) has "Kao-paé" as the Mandarin name, and "Co-ba" as the common Shanghai vernacular. He also gives interesting particulars concerning the cultivation of Co-ba. There are two varieties, the Co-ba of Fou Tcheou (Foo Chow) and that of Shanghai. The former does not produce stolons, and yields two crops annually. It is cultivated regularly on flooded ground, and propagated by planting the young suckers which form at the base of the shoots in manured mud. The common or Shanghai Co-ba makes stolons very freely, and establishes itself when once planted. For that purpose the Chinese pull the tufts up between the middle of November and the middle of December, expose them to the sun for a few days, and plant them in stagnant or running water with a muddy bottom. After this the next crop will be ready in about ten months time. The vegetable as it is brought to market consists, according to Hance, of "cylindrical pieces, of a white colour, $2\frac{1}{2}$ to $3\frac{1}{2}$ inches long, and 1 to $1\frac{1}{2}$ inches in diameter, tapering upwards into a conical point, and surrounded and surmounted by the leaves and culm from which they are readily detached. In taste the raw shoot is not unlike a half-ripe nut; but it is never eaten uncooked, but by the Chinese is stewed with meat, and by foreigners cut longitudinally into two or three pieces, well boiled and served with melted butter."

A short note on the cultivation of this Water-Rice in Tonkin is contained in the eighth volume of the 'Bulletin Économique' for Indo-China (1905, pp. 1098–1100). According to it a form of *Zizania latifolia* is cultivated on a large scale at the village of Van ho near Hanoi. In Annamese it is called 'cu nieng' or 'cay

lua mieu,' and it evidently corresponds to the Co-ba of Shanghai. It is sold in bundles or packets of ten at about 2 cents per packet from the first days of October to the beginning of January. From the figure on p. 1100 it appears that the lower portions of the stems up to about 15 cm. from the base are sent to market; but very probably only the lower swollen portion, about 1·5 cm. thick, is eaten.

The Co-ba seems to flower very rarely (E. Simon, l.c., p. 93), and it is probable that the barren plants of *Z. latifolia* at Kew, mentioned below, belong to a kind of Co-ba. In the wild state *Z. latifolia* flowers and fruits freely, and the grains were in ancient times much valued as food (Bretschneider, *Bot. Sin.*, iii., p. 352). In the Pen ts'ao Kang mu, the great Chinese Materia Medica and Natural History of the 16th century, the grass is even spoken of as a cereal (Bretschneider, l.c. iii., p. 352) under the name of Ku mi, *i.e.*, Ku grain, Ku being the old Chinese name of *Zizania latifolia*. Siebold (*Syn. Plant. Oecon. Jap.*, 1827, no. 368) also reports the use of the grain for making flour in Japan and especially mentions Mino and "Cosjuu" (Kotsuke?) as the Provinces where the *Zizania* is grown for that purpose. It is figured as "Makomo" (*Hydropyrum latifolium*) in the "Useful Plants of Japan," published by the Agricultural Society of Japan, vol. ii., fig. 346. In the English text to this publication (p. 94) it is stated that "the seeds are used as food, and the new sprouts are also edible." A further note on p. 4, says "the seeds of this plant mixed with rice are consumed as food by boiling." To avoid confusion it may be observed that 'Makomo' is referred in the English text on p. 4, no. 17^b, to *Zizania aquatica*, but in the corresponding place in the Japanese "Contents and Indices" (p. 2, no. 17^b) to *Hydropyrum latifolium*.

Z. latifolia at Kew.—This grass has for many years been grown on the margins of the lake, and in the collection of aquatic plants in the Herbaceous Department. It forms perennial rhizomes which grow in mud or loamy soil partly or wholly submerged, spreading about, and sending up every year tufts of leaves 4 to 5 feet long. None of the plants has ever been known to flower at Kew. It appears quite capable of holding its own in association with such neighbours as *Iris Pseudacorus*, *Typha angustifolia*, *Acorus Calamus*, etc., but owing to an evil habit of turning yellow and dying at the leaf tips, it has a rather shabby appearance except when the leaves are quite young. Whatever its value as a vegetable may be it has little to recommend it as an ornamental grass in this country, and although it can be cultivated with less trouble than *Z. aquatica* should never be preferred to it on this ground.

LVIII.—MISCELLANEOUS NOTES.

Miss J. J. Clark.—On the results of the recent competitive examination in connection with the vacancy on the Herbarium staff, Miss J. J. Clark, B.Sc., has been appointed by the President of the Board of Agriculture and Fisheries to the post of Assistant in the Royal Botanic Gardens, Kew.

Major Henry Alfred Cummins, C.M.G., F.L.S., who acted as Assistant for India in the Herbarium at Kew during the absence of Mr. J. F. Duthie in 1906, has, we understand, been appointed Professor of Botany, University College, Cork.

Mr. C. W. Smythe.—We regret to have to record the death of Mr. C. W. Smythe, Agricultural Superintendent, Sierra Leone, on October 15th, shortly after his return to England on leave. Mr. Smythe entered the Royal Botanic Gardens, Kew, in March, 1900, and left in 1904 to take up the duties of Curator of the Botanic station in Sierra Leone (*K.B.* 1904, p. 13), and subsequently was appointed Agricultural Superintendent.

He had been deputed to visit the forests and forestry schools in Germany during his present leave, and was about to proceed to the continent when he was overtaken by his fatal illness.

César Chantre.—In the person of M. César Chantre there passed away, on August 8th last, at Rocher, near Lamastre, Ardèche, France, an old contributor and frequent visitor to the Kew Museums.

A native of Lyons, where he was born in 1841, he came to London about 43 years ago as representative of a Lyons business house, with which he was connected by family ties. Residing at Haverstock Hill, and spending his whole days in the city, he managed to combine his love of the country—so much as a near London suburb would allow—with his interest in vegetable, animal and mineral products, the richness of which can be estimated only by visits to London's extensive docks, or the commercial sale rooms. These he constantly attended with a keen eye for anything new to commerce, or for any remarkably fine specimens, whether in size or quality. Gums, resins, articles of food, medicine, or manufacture, all had an interest for him, as products of one or the other of the great kingdoms of nature.

It follows, therefore, that when he left London, in 1883, he had got together a large and carefully selected series of specimens, portions of which he freely gave, at different times, to the Kew museums, when he found during his frequent visits, mostly on Saturday afternoons, that the specimens in that collection were not quite so good as his own, or perchance that he possessed specimens which were not represented at all at Kew. M. Chantre was not only a good economic botanist, but he loved a ramble in the open country with vasculum and butterfly net, especially when accompanied by his old friends, the late Mr. George Nicholson and the writer of this notice. It is recorded that on one of his rambles near Harrow he discovered the rare British plant *Teucrium Botrys*, which had been previously known to occur only near Box Hill.

He was elected a Fellow of the Linnean Society on the 2nd May, 1878, and his letter of resignation, owing to his leaving London, was laid before the Council on the 7th June, 1883.

During his long residence in London he became thoroughly accustomed to English habits, and had the greatest admiration for English home life. His geniality and courtesy made him friends wherever he went. He made a journey to China in connection with his business, and returned with numerous specimens and much information regarding them. His business life ended in 1905, when he retired to Lancaster, chiefly on account of his wife's health. He kept up his interest in his old studies, as the following extract from a letter written by him from St. Raphael, to the writer of these notes in February, will show. He says: "What a pity you cannot run down to the Azure Coast. What fine things we would admire together. I would show you so many. I know now the entire coast from St. Tropeze to Vintimille (Italy), having done it all on foot at various times. The region of St. Raphael is the centre of the finest porphyric region of Europe, and the variety of rocks is immense. I have made a fine collection of them these last two years."

He devoted much of his time in his latest days to religious, social and philanthropic works.

J. R. JACKSON.

Palo Amarillo (*Euphorbia fulva*, Stapf; syn. *E. elastica*, Altamirana and Rose, not of Jumelle).—Some particulars regarding this plant as a new source of rubber appeared in the *Kew Bulletin*, No. 7, 1907, p. 294. The following supplementary information upon the subject is gathered from an illustrated article on "The Rubber Plants of Mexico" by Dr. H. H. Rusby in "Torreya" Vol. 9, No. 9, September 1909.

From this paper it appears that the "Palo Amarillo" will not grow upon the alluvial plains of Mexico but only on the rocky hill-sides where the drainage is good. The bark is described as being thick and succulent at first smooth and of a light yellowish-green colour. That of the trunk and large branches soon excoriates in large, very thin, papery, translucent sheets of an orange-yellow or orange-red, colour, which impart to the tree a shaggy appearance, and a colour that has given the trunk its vernacular name "palo amarillo" or yellow trunk.

The flowers appear in January or thereabout, before the appearance of the new leaves, and the fruits mature in June and July.

As soon as the bark is wounded, a milky juice exudes which is very irritant and capable of producing violent inflammation of the eyes if it enters them, as it is quite liable to do in spattering, when the tree is cut.

The great value of this tree as a rubber producer lies in its abundance over large areas and the proximity of the trees to one another facilitating collection of the milk, as well as the ease with which it can be propagated and the rapidity of its growth.

All that is necessary for propagation is to thrust the newly-cut branches into the soil, where they practically all grow. From them

the tree reaches its full size in from 5 to 7 years. These considerations appear to incline Dr. Rusby to the opinion that if all other sources of rubber were to fail, this one could probably supply the world's entire requirements.

The properties of the "palo amarillo" rubber are peculiar. Taken by itself it is of only medium quality, but mixed in suitable proportion with other varieties, especially with para rubber it markedly improves them.

J. M. H.

Callitris sinensis.—In Tschirch (*Die Harz und die Harzbehälter*, vol. i., p. 536) there is a paragraph on the resin of *Callitris sinensis*, of which the author says that it is produced in China and used there medicinally as well as technically, adding that it has not yet been examined. As the name *Callitris sinensis* does not appear in the *Index Kewensis*, nor in the *Index Florae Sinensis* (Enumeration of all the plants known from China Proper, &c.) by Forbes and Hemsley, but on the other hand has found its way into certain publications, it seems to be useful to give a brief account of it. The author, responsible for the name, is Dr. L. Soubeiran. He has the following paragraph in his *La Matière Médicale chez les Chinois* (1874, p. 134):

"Callitris sinensis, *jou-yang-zu sian*, Tatarinow, 498; *yun hiang*, F. P. Smith, 1019; *jong-hang-song*, Debeaux. La résine de Sandaraque, un peu plus blanche que celle du mastic, est employée, ainsi que les autres résines, comme stimulant dans le traitement des ulcères (elle fait la chair), comme déodorisant. Elle sert aussi à préservir les vêtements des attaques des insectes."

Turning to Tatarinow's *Catalogus Medicamentorum Sinensium*, (1856), of which there is a manuscript copy at Kew, we find the name rendered by Soubeiran as '*jou-yang*' and '*zu-sian*,' in Chinese characters with the translation:—Sandarach. The same characters are transliterated by Bretschneider in his *Botanicon Sinicon*, vol iii., p. 608, as '*ju hiang*.' Of this Bretschneider says on p. 462. 'Tatar. (Cat. 65) identifies *ju hiang* with *Resina Sandarac*, but, the drug *ju hiang* which I procured from a Chinese drug shop, and which has been examined by Professor Flückiger, was *Olibanum* or Frankincense. The ancient Chinese descriptions agree." In fact, as Bretschneider (*l.c.*) points out, Cleyer had identified *ju hiang* with "Thus" (incense), stating in his *Specimen Medicinae sinicae*, (1682), *Medic. Simpl.* No. 210: "*Jù hiam̄*. Est *thus*, acro-dulce, ulceribus medetur, creat carnem, sistit dolores, eximitur illi oleum"; and similarly Williams, in his *Chinese Commercial Guide* (1863), p. 93, says: "*Olibanum, ju hiang* (*i.e.* milk perfume). Article of import." Flückiger and Hanbury in their *Pharamcographia* (1874), p. 122, also refer "*ju-siang* (*sic*) *i.e.* milk perfume" to *Olibanum* and observe that in 1872 Shanghai imported of this drug no less than 1,360 piculs (181,333 lbs.).

It is now fairly clear how the confusion, and with it the otherwise entirely unsupported name *Callitris sinensis*, arose. Soubeiran, relying on Tatarinow's and F. P. Smith's erroneous identification of *ju hiang* with Sandarach, evidently concluded that this must be the

product of a *Callitris* and, as it was to him a Chinese drug, of a species other than *C. quadrivalvis*—the origin of the usual Sandarach—he named the species *Callitris sinensis*, without any actual knowledge of the plant. The name has thus no foundation whatever, and ought to be dropped altogether.

O. S.

Wolffia denticulata, *Hegelm.*—This species was described by Hegelmaier (*Die Lemnaceen*, p. 133, t. iii., fig. 16–23) in 1868 from specimens found amongst *Lemna minor*, L., collected in South Africa by Krauss. It has not been again observed until recently, when Mr. R. G. Mason, of Upper Tooting, forwarded specimens to Kew, which he had received from a correspondent at Durban, Natal. Hitherto, the exact locality for this plant has been unknown, but as Krauss collected *Lemna minor* in only two places, viz., Zwartkops River in the Uitenhage Division and Umlaas River in Natal, and as the specimens just received come from near the latter place, it seems reasonable to infer that Krauss obtained *Wolffia denticulata* from the Umlaas River. His specimen of *Lemna minor* in the Kew Herbarium from that locality is not mixed with any other plant.

The individual fronds are linear, 3·5 mm. long and $\frac{1}{10}$ to $\frac{1}{8}$ as broad, very thin, entire along the margins, but slightly denticulate at one end. At the other end is a funnel-shaped depression, from the base of which a new frond is produced and grows out in the same straight line as the parent plant, while a second new frond, often arising afterwards by the side of the first, curves outwards and lies alongside the original one; this process is repeated until a bunch of plants is formed. Pigment-cells occur in the epidermis, but are most numerous towards the ends of the plant. There are a few elongated cells in the interior of the frond at the end from which the new fronds arise, but they do not shew either spiral or annular thickening. The flowers are still unknown.

C. H. W.

Botanical Magazine for October.—The Mexican *Cereus amecamensis*, Heese, which has been figured from a plant presented to the living collection in 1900 by Mr. H. J. Elwes, is closely allied to the well-known *C. speciosissimus*, DC., the chief differential characters being that in the former the tips of the growing shoots are pale green instead of a dull purplish tinge, and the flowers are pure white. The species was discovered, growing as an epiphyte, on Iztaccihuatl Mountain, near Amecameca, at about 7,800 ft. above sea-level. *Cissus adenopodus*, Sprague, is a comparatively new species for the introduction of which Kew is indebted to Mr. M. T. Dawe, who sent it in 1905 from the Mufukamata Forest, Uganda. It is distinct and very ornamental, having long trailing stems and red 3-foliolate leaves, which are clothed on both sides with long slender adpressed hairs. Its nearest ally is probably *C. Buchanani*, Planch. *Laurelia serrata*, Bertero, the Huanhuan tree of the southern parts of Chili, belongs to the small order *Monimiaceae*. It is quite hardy in the late Mr. Acton's

garden at Kilmacurragh, Wicklow, where a tree upwards of 40 years old has attained a height of 33 ft. The drawing was prepared from material sent to Kew by Mr. F. W. Moore, of Glasnevin, and was obtained from the fine specimen referred to. *Rhododendron coombense*, Hemsl., is described as a new species belonging to a group of very closely allied forms in which *R. concinnum*, Hemsl., is included. It was raised in the Coombe Wood nursery of Messrs. J. Veitch & Sons from seeds collected in China. *Bulbophyllum campanulatum*, Rolfe, a new species from Sumatra, is a curious and pretty little plant, with pale purplish flowers umbellately arranged on a slender scape which is decurved at the apex. The figure was prepared from a plant which was received from the Brussels Botanic Garden in 1908.

Botanical Magazine for November.—The plants figured are: *Magnolia Delavayi*, Franch., *Pieris formosa*, D. Don, *Cotoneaster moupinensis*, Franch., forma *floribunda*, Stapf, *Cephalotaxus drupacea*, Sieb. et Zucc., and *Kitchingia uniflora*, Stapf. The *Magnolia* is an evergreen species, native of China, where it was collected in Yunnan for Messrs. J. Veitch & Sons, who presented a plant to Kew in 1902. This flowered in July 1908, providing the material for the illustration. At Kew and at Coombe Wood it thrives very well against a wall, and in such a situation passed through the late severe winter uninjured. The *Pieris* is a handsome and floriferous shrub or small tree, which has been in cultivation for upwards of half a century and is often referred to as *Andromeda formosa*. It is a native of India and China. The figure was prepared from a plant raised from seed received from the Royal Botanic Garden, Calcutta, in 1902. It has now reached a height of 4 feet, and flowered profusely in May, 1908. *Cotoneaster moupinensis* comes from Western China where it was first collected by the Abbé David in 1870, and later by a correspondent of Mr. M. L. de Vilmorin, and by Mr. E. H. Wilson when travelling for Messrs. J. Veitch & Son. It is an attractive shrub, with large bullate leaves and brilliant red berries. The form *floribunda* differs from the type in having more numerous flowers to the inflorescence, and *C. bullata*, Bois, is regarded as synonymous. The figure is based on material furnished by a plant presented to Kew in 1905 by Mr. de Vilmorin. *Cephalotaxus drupacea*, from China and Japan, has been in cultivation at Kew for many years, one specimen, that from which the figure was prepared, being 10 feet high and 15 feet through. The *Kitchingia* is a pretty little crassulaceous plant from Madagascar, having terminal, usually solitary rose-coloured flowers, which are about 1 inch long and are inflated-tubular in shape. The Kew plant was raised from a cutting sent by Mr. G. Bouvet, Director of the Jardin des Plantes at Angers.

Agriculture in the Tropics.—Under this title Dr. J. C. Willis, Director of the Royal Botanic Gardens, Ceylon, has recently published an elementary treatise on tropical agriculture. The work is divided into four parts. Part I deals with soil, climate,

transport, tools, &c., concluding with a short chapter on agriculture in the tropics in primitive times and its gradual change to more modern methods.

In Part II the principal cultivations of the tropics are set out in detail, and a large number of the different tropical products are illustrated. Tables are given in many cases of the amounts of the different articles exported, but it is unfortunate that these tables are not carried beyond the year 1905 in most cases, although the book bears the date of publication 1909. Suggestions as to the improvement of tropical production by careful cultivation, hybridization, &c., are made throughout the chapters. It is of interest to notice that in Java, Liberian coffee has been successfully acclimatised up to 3,000 feet by taking the seed a few hundred feet higher up at each generation. The chapters in this part are well arranged, and deal with plants yielding similar economic products. It is, perhaps, somewhat unfortunate that owing to the work being an "Elementary Treatise" the author has not been able to devote greater space to this part of the book. A chapter is occupied with the diseases of plants in the tropics and their treatment, but it is not of sufficient scope to deal with the subject on more than general principles.

Part III contains a general consideration of agriculture in the tropics, and is concerned with peasant agriculture, finance, education of the peasant, and kindred subjects, and concludes with a useful summary of the agricultural needs of the planting enterprise. In the chapter on the relations of the peasant to the land and crops the baneful influence of the money-lender who usually charges 50 per cent. interest is pointed out. This is followed by a discussion of co-operative credit societies, which are now doing good work in parts of India and Ceylon, &c.

The careful education of the peasant, as is pointed out, is the only method likely to be of value in improving the condition of agriculture in native hands, and this must be a very slow process. Something has already been done by the establishment of school gardens, and by these means and by peripatetic instructors much good is likely to arise in the future. As an instance of native conservatism, the Sinhalese villager will only manure betel-pepper with the leaves of *Croton lacciferum*, and refuses to employ another manure as good or perhaps better; but before urging him to adopt some other method it is necessary to discover the reasons for his faith, and perhaps at the same time valuable knowledge may be gained in the process. Not only has the peasant proprietor much to learn, but also the owner of the large estate and Dr. Willis has much of value to say to both classes.

The concluding part is taken up with a consideration of agricultural organisation and policy and questions as to the administration of departments, laying out of lands, and the formation of agricultural societies. An adequate index concludes the volume.

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

No. 10.] [1909.

LIX.—PHYTOCHEMICAL INVESTIGATIONS AT KEW.

By the late Dr. M. Greshoff.

Director of the Colonial Museum, Haarlem.

In August, 1909, I had the privilege of examining phytochemically in the Jodrell laboratory at Kew a number of plants cultivated in the celebrated Royal Botanic Gardens.

During this examination I received generous help from the Kew scientific staff; my indebtedness to them is here gratefully acknowledged.

In this report I wish to give a brief survey of my results; at present only a part can be published, as it was found necessary to examine further many plants at another season of the year. I hope to do this in 1910, and then to bring together the additional results in a second report.

At Kew there was a unique opportunity, not only of supplementing and checking previous observations made in my own laboratory at Haarlem, but especially of investigating chemically plants which had not been analysed hitherto, and thus of collecting new data for pharmacology, toxicology, and in a wider sense, for *comparative phytochemistry*, *i.e.* the knowledge of the connection between the natural relationship of plants and their chemical composition. For many years I have paid attention to comparative phytochemistry and was connected from 1888–92 with the Botanic Gardens at Buitenzorg (Java). The subject has always attracted me, and considerations connected with it have influenced me both in the laboratory and in theoretical study. Perhaps I may therefore be permitted once more briefly to point out what is the task of the chemist in a botanic garden, and especially what is the relation between his chemical work and botanical science, especially systematic botany.

Since plants are no longer classified according to a single character (*i.e.* according to an artificial system), but attempts are made to unite into natural groups such plants as are considered to

(14870–6a.) Wt. 108–471. 1375. 1/10. D & S.

be related, the systematic botanist desires to know that relationship in *all* its manifestations.

Not only are the structures of the flower and of other organs of the plant carefully compared in the different groups, but the history of the development of those structures is traced. In addition the anatomical characters revealed by the microscope have been successfully utilised to throw light on the relationships of plants, and in this way it has not infrequently been possible to define an order, genus, or species much more sharply than would be possible by organographic characters alone. Some investigators have rightly attempted to elaborate this anatomical investigation by applying microchemical tests for constituents such as alkaloids, glucosides (*e.g.* saponin), hydrocyanic acid, etc., which are typical of certain groups of plants. In this manner, therefore, chemistry has already come to the assistance of the botanist. Often, however, the result of this botanical microchemistry is unsatisfactory because many plant constituents have first to be isolated from the tissue and purified, before they can be recognised with certainty, and for this isolation the botanist not infrequently lacks the experience and critical knowledge of the chemist.

Chemistry, then, can only give complete assistance to systematic botany, when it is used not incidentally, as a botanical aid, but when opportunity is offered in botanical surroundings for the independent prosecution of the subject, *i.e.* for the chemical study of the general and special constituents of the plant. That this study of phytochemistry, apart from its own scientifie value and its close connection with systematic botany, is also of practical importance, may be briefly shown.

The vegetable kingdom supplies us with food and clothes and satisfies many of the numerous material wants of modern life; moreover, a not inconsiderable proportion of drugs are still derived from plants. There is no other way of ascertaining whether new plants of economic value, including medicinal plants, which are introduced from foreign countries, deserve general attention, than by subjecting them to analyis, by performing their chemical evaluation. This applies not only to medicinal, but to all other technical plants, and also to plants which are reported to be food-stuffs or poisons. It therefore appears clear that chemistry and botany should co-operate in the study of the plant world; yet it is a matter for surprise that this co-operation is so rarely brought into practice. There are whole natural orders of which we know nothing chemically, of which not a single representative has been analysed, so that our knowledge concerning their "virtues" is limited to popular belief and popular experience, a source of knowledge naturally good, but often obscured by superstition.

Strictly speaking one might demand that every accurate description of a new genus or of a new species should be accompanied by a short "chemical description" of the plant. Instead of working in this direction, and seeking the aid of chemists, some systematic botanists now neglect in their diagnoses even that which might give at least a preliminary chemical insight of the plant, such as details of smell and taste, and accounts of popular applications as food, drug or poison. The older botanists carefully

summarised such details, but among the later ones there are some who neglect all this, and who are not even concerned with the popular names of their plants. They invert the adage "*non scholae sed vitae*" and are not concerned with the utility of their writings outside their own circle of botanical colleagues.

It will be asked, however, is it impossible for botany and chemistry to pursue their objects separately? Yes. It is necessary that the chemical investigations should *begin* in the botanic gardens themselves, because it is only there that one can decide experimentally:—1. What part of the plant is best suited for analysis and also in what part of the vegetative period the active principle is most abundantly present. 2. Whether constituents occur in the fresh plant which disappear on drying. 3. What is the exact name and nature of the plant under investigation and what are its nearest relations, or in what other species and genera does the same chemical constituent occur. We may further suppose that in questions of microscopical technique, of plant physiology, cultivation, &c., chemistry will be consulted more readily and to better advantage if it is found side by side with botany. I consider it a special disadvantage that the chemist who examines plants or parts of plants without botanical guidance and far from a botanical centre, so easily remains uncertain as to the true name and nature of his material. What is indeed the use of examining a root or a bark or any other material under a false name (which afterwards leads to confusion) or of analysing material of which the botanical origin is not known? Such work resembles that of mediæval monks and cannot be utilised in comparative phytochemistry.

It has just been remarked that the chemical investigation of plants must *begin* in a botanic garden. When the elementary data concerning the presence or absence of special plant subtances in a given genus or species have once been obtained, the continuation, *i.e.* the complete chemical study (including that of the constitution) of plant substances on the one hand, and their toxicological and pharmacological investigation on the other, can take place in the laboratories proper to these sciences. First, however, there must be a phytochemical basis. In a second report I hope to give a scheme by which, in my experience, the preliminary phytochemical examination may best be conducted in a botanic garden (assuming that it contains a simple laboratory) in such a way that no important plant substance may escape attention, and yet that simple resources and a comparatively small amount of chemical labour may suffice.

As an introduction to this first report, I now only wish to add a few remarks on those plants and plant constituents which more especially engaged my attention during my work at Kew. With respect to the choice of plants from that large collection I have been chiefly influenced by considerations of comparative phytochemistry. In addition, I wished especially to examine genera of which I had already previously obtained material either at Buitenzorg or at Haarlem. As regards the plant substances with which this preliminary examination was chiefly concerned, I paid most attention to the distribution of tannins and of alkaloids, and further looked especially for

hydrocyanic acid and for saponin (two substances, the taxonomic value of which has already been referred to). This choice of plant substances may be defended as follows :—

Tannin.—While it was formerly assumed, simply on account of the black coloration with iron salts, that tannins are present in almost all plants, Dr. J. Dekker has shown by his investigations at Haarlem, that real tannins are comparatively rare and that there are whole natural orders which do not contain any tannin. The reaction with ferric chloride by itself is valueless as evidence ; only when it is confirmed by the reaction with a quinine solution and with a gelatin solution, is it possible to consider the presence of tannin established. It is therefore desirable to collect new and reliable data concerning the distribution of tannins in various natural orders, as was done experimentally by Dr. Dekker during the preparation of his monograph (which appeared as Bulletin Nos. 35 and 39 of the Colonial Museum at Haarlem) ; I have not neglected the unique opportunity at Kew of working on the same lines. A knowledge of tannins is very useful with regard to medicinal and technical plants and is also important in comparative phytochemistry.

Alkaloids.—Our knowledge concerning the distribution of alkaloids in various natural orders is already fairly complete, because we are here concerned with crystalline, well-defined substances of special medical or toxicological value, which are often characterised by a bitter taste or poisonous properties and which, for nearly a century, have been diligently searched for by the pharmacists of the whole world. Nevertheless, there are here also lacunae in our knowledge, and it was my object at Kew to attempt to fill these in some cases. Careful attention was therefore paid to the taste of the plants under investigation and the decoction of every plant was tested for alkaloids by means of three reliable reagents : a solution of picric acid, a solution of iodine, and Mayer's reagent (potassium mercuric iodide solution). If these tests gave a positive result, some material was, if possible, dried carefully for isolation and examination of the alkaloid.

Hydrocyanic acid.—In the last two decades the occurrence of hydrocyanic or prussic acid (HCN) as a widespread constituent of plants has received so much attention, and has led in England, especially in the laboratory of the Imperial Institute, to such important chemical work, that it will be clear why the author of this report during his investigation paid attention to this substance. Its presence frequently throws a remarkable light on the fatal toxic effects on man and animals often ascribed to certain plants and occasionally revealed by them quite unexpectedly. It becomes evident from this first report that a number of new cyanogenetic plants have been discovered by me at Kew ; I have also tried to delimit the known centres of the distribution of prussic acid. This is now done more readily than formerly, because the distillate of the plant is not required in the first instance for the detection of hydrocyanic acid ; but as a preliminary test, the simple and elegant reaction with picric acid-soda paper, which was described in 1906 by Prof. L. Guignard, of Paris, may now be utilised. Quite a number of additions have already to be made

to the list of hydrocyanic acid plants, which was communicated by me with explanatory details to the meeting of the British Association at York, in 1906. I hope to append this list, brought up to date and arranged according to natural orders, to my second report.

Saponin.—Of still greater pharmacological and toxicological importance than the occurrence of hydrocyanic acid in a given plant, is the discovery in it of a poisonous glucoside of the saponin group. A number of medicinal, toxic and economic properties of the plant may thus suddenly become clear. Medicinally: its use as diuretic, antisyphilitic (*e.g.*, *Sarsaparilla*), expectorant (*e.g.*, *Senega*), emetic, vermifuge, taenicide, &c. Toxicologically: various poisonous actions on man and on animals, ascribed to the plant by popular experience, and further, the important application of saponin-containing plants as fish poisons and as insecticides. Economically: the use in washing as a substitute for soap (*e.g.*, *Quillaja*). For further information I refer to the excellent work of Prof. R. Kobert, "Beiträge zur Kenntniss der Saponinsubstanzen," 1904. Unfortunately in the case of saponins there are no well-defined chemical characteristics like those of hydrocyanic acid, but for practical purposes three properties suffice: in the first place, the marked frothing of a plant extract containing saponins, which persists at very great dilutions (sometimes to 1 in 3,000, occasionally even to 1 in 15,000); secondly, the hydrolysis of glucosidal saponins by boiling with dilute acids and the colour reactions of the sapogenin formed; thirdly, as an important indication of the general toxicity, the determination of the haemolytic power. In the following report, the figures 1–300 mean, for instance, that an extract of the plant at a concentration of 1 part in 300 dissolves an equal volume of diluted (1 per cent.) fresh blood of the ox.

I now append a list, in alphabetical order, of the genera (according to the nomenclature of the *Index Kewensis*), of those plants with which positive results were obtained during my investigation at Kew, supplemented as far as possible by earlier or later results at Haarlem. Of course I also noted negative results for my own information, but in the examination of plants these are markedly less definite than positive ones, because the season of the year, the age and vitality of the plant, &c. may have much influence. I hope to refer further to some results in the second report. For this journal I have purposely formulated the results as briefly as possible, in a few lines, but have added some details concerning the plant itself; its systematic relationship and the medicinal and other properties ascribed to it*. I hope that I have thus rendered the report somewhat more readable and interesting, and have made

---

* The medicinal notes have mostly been taken from the great work of the late Prof. G. Dragendorff: Die Heilplanzen der verschiedenen Völker und Zeiten; ihre Anwendung, wesentliche Bestandtheile und Geschichte, 1898. For the toxicological notes I have especially used my "Monographie der giftige en bedwelmende planten bij de vischvangst in gebruik" (Monograph on fish poisons) which is at the same time a survey of the most poisonous plants of the world, and their distribution in natural orders. Of this work vol. I. was published in 1893 at Batavia and vol. II. in 1900; vol. III. will be ready for the press in 1910.

clear by these examples what was said above about the utility of phytochemical investigation in botanic gardens.

Abelia (Caprifoliaceae).

The leaves of *A. uniflora*, R. Br., contain saponin.

Acacia (Leguminosae-Mimoseae).

At Kew I found saponin in the leaves of *A. pulchella*, R. Br.; according to notes made at Haarlem saponin also occurs in the seeds of *A. verticillata*, Willd.

Various other species (such as *A. anthelmintica*, Baill., *A. Cunninghamii*, Hook., *A. concinna*, DC., *A. delibrata*, A. Cunn.), were already known to contain saponin. Six species of *Acacia* are mentioned as fish poisons in my "Monographie der bedwelmende planten bij de vischvangst in gebruik," Vol. II., p. 69; this is probably connected with the presence of saponins.

Alectryon (Sapindaceae).

The leaves of *A. excelsum*, Gaertn., were found to contain much hydrocyanic acid.

The fruits of the species examined, a New Zealand tree, are said to be edible, and the seeds are said to contain oil.

In 1897, at Buitenzorg, van Romburgh found hydrocyanic acid in a species of *Cupania*, belonging to this order; in addition *Schleichera*, has already been known for a long time to contain hydrocyanic acid.

Amarantus (Amarantaceae).

The leaves of *A. hypochondriacus*, L., give an extract which froths strongly and indeed contains saponin. This result was confirmed by examining the seeds of *A. hypochondriacus*, L., and *A. melancholicus*, L. (= *A. gangeticus*, L.), which also contain a little saponin. Amarantus-saponin is only slightly toxic, giving but feeble haemolysis.

Amarantus was not yet known to contain saponin, but saponin was recently recorded for *Achyranthes bidentata*, Bl. This substance is doubtless also present in other species and the use of some species as an anthelmintic in popular medicine, *e.g.*, that of *A. viridis*, L., is connected with this.

Anacyclus (Compositae).

At Kew I found hydrocyanic acid (and benzaldehyde) in the seeds of *A. officinarum*, Hayne, and at Haarlem in those of *A. pedunculatus*, Pers.

Compare for the distribution of HCN in this order the note on *Dimorphotheca*.

Andrachne (Euphorbiaceae).

The leaves of *A. colchica*, Fisch. et Mey., are characterised by a marked toxicity, which according to my analysis depends on the presence of hydrocyanic acid. I could also detect the odour of benzaldehyde, but had too little material for further investigation.

For a long time the genus *Andrachne* has been known to be poisonous; the amount of hydrocyanic acid found affords an explanation of this, and also of Watt's statement that the foliage of *A. cordifolia*, Muell. Arg., has caused cattle poisoning in British India. Possibly the powerful antiseptic action of hydrocyanic

acid is the reason why an extract of *A. Cadishaco*, Roxb. (= *Cleistanthus collinus*, Benth. et Hook.), is used for washing ulcers.

Anthemis (Compositae).

For more than a year the investigation of this genus has been carried on in my laboratory at Haarlem, and I utilised my stay at Kew in order to extend it to some new species. In summarising the results hitherto obtained, it may be said that the seeds of the following contain much HCN : *A. aetnensis*, Schouw, *A. altissima*, L., *A. arvensis*, L., *A. austriaca*, Jacq., *A. Blancheana*, Boiss., *A. chia*, L., *A. Cota*, L., *A. elbuensis ? A. montana*, L., *A. rigescens*, Willd. In all cases I determined the amount of hydrocyanic acid quantitatively ; it is largest in *A. Blancheana*, namely 0·15 per cent., and diminishes in other species to 0·03 per cent. It is remarkable that the cyanogenetic substance is limited to the seeds ; we have never found it in the foliage. Most of the above-mentioned species have been cultivated in the laboratory garden at Haarlem, but unsuccessfully as regards the discovery of hydrocyanic acid outside the seeds. The seeds were mostly presented by the Jardin des Plantes at Paris. From a large quantity of seeds of *A. aetnensis*, and *A. chia*, obtained from the firm of Haage and Schmidt of Erfurt, I have prepared the cyanogenetic glucoside. It belongs to the amygdalin type, giving off hydrogen cyanide and benzaldehyde on hydrolysis. The strong odour of benzaldehyde may even be observed on grinding the seeds with water.

Anthemis contains *i.a.* the parent plant of "Roman Camomile" (*A. nobilis*, L.) of which the ethereal oil has frequently been examined. Apart from this little is known as to the activity of the genus. *A. Cotula*, L., is sometimes called in English "Poison Daisy." Compare the note under *Dimorphotheca* concerning hydrocyanic acid in *Compositae*.

Aphanopetalum (Saxifragaceae).

The leaves of *A. resinosum*, Endl., have a very bitter taste. The extract froths slightly and shows alkaloidal reaction. I was able to extract the alkaloid from a small quantity of leaves by shaking with ether. The plant deserves further examination.

Arrhenatherum (Gramineae).

The grass *A. avenaceum*, Beauv., yields an extract which froths strongly and contains saponin ; this is confirmed by the investigation at Haarlem, of the seed of *A. elatius*, Beauv., which is indeed identical with this species according to the *Index Kewensis*. An extract of the seed froths at 1–1000 but haemolyses only at 1–100.

Astragalus (Leguminosae-Papilionaceae).

The plant of *A. maximus*, Willd., contains much saponin, the same is true of the seeds of *A. baeticus*, L., *A. galegiformis*, L., and *A. hamosus*, L.

A number of species of *Astragalus* have been recorded as poisonous to cattle ; some are counted in America among the notorious loco-weeds. Saponin had not yet been found in this genus but alkaloids were known. The root of the species examined, *A. hamosus*, L., is known as a diuretic (Dragendorff, l.c. p. 323).

Atriplex (Chenopodiaceae).

At Kew, I examined two species of this genus, viz., *A. Halimus*, L., and *A. Nuttalii*, S.Wats., and found saponin in the leaves of both, especially in the last-named species. At Haarlem, I had at my disposal seeds of *A. hortensis*, L., *A. laciniata*, L., *A. rosea*, L., *A. tatarica*, L. and *A. vesicaria*, Hew., and found much saponin in all; the haemolysis by an extract of the seeds is moderately great, 1–250 to 1–750.

Atriplex is new as a saponin plant; in the same order only *Chenopodium mexicanum*, Moq., was known to contain saponin. We may remember, for instance, that the foliage of *A. hortensis*, L., is used as a diuretic, the seed as an emetic, which is quite plausible on account of the saponin-content. In China, a skin disease occurs "atriplicismus" caused by a poisonous species of *Atriplex*?

Buddleia (Loganiaceae).

The leaves of *B. globosa*, Hope, contain saponin. Seeds of *B. Lindleyana*, Fort., examined at Haarlem, gave an extract containing saponin, which frothed at a dilution of 1–500 and haemolysed at 1–800. There is also a little saponin in the seeds of *B. variabilis*, Hemsl. It is known that the leaves of *B. madagascariensis*, Lam., are used as a soap substitute, the twigs of *B. brasiliensis*, Jacq., *B. curviflora*, Hook. et Arn., and *B. verticillata*, H.B. et K., as a fish poison and other species as taenifuge or vermifuge, and also as diuretic and expectorant.

Callicoma (Saxifragaceae).

The leaves of *C. serratifolia*, Andr., contain saponin, but not in large quantity.

Calophyllum (Guttiferae).

The leaves of *C. Calaba*, Jacq., contain saponin. Poisonous properties are not unknown in this genus; some *e.g.*, *C. Inophyllum*, L., and *C. montanum*, Vieill., are used as fish poisons.

Canella (Canellaceae).

Canella and *Cinnamodendron* are the only genera of this small order.

It is of some pharmaceutical interest that *C. alba*, Murr. (Engler and Prantl refer to *C. alba* under the name *Winterana Canella*, L.), the plant from which white cinnamon is obtained, contains much hydrocyanic acid, also that this acid does not occur in the drug. An investigation of some fresh leaves which I had at my disposal at Kew, proved this with certainty. The leaves further contain a volatile oil and an acrid resin which causes a burning sensation on the tongue. It would be interesting to examine also the seeds of these plants for the cyanogenetic principle, but the material for this is not obtainable in Europe. The statement of A. Stahl (1884) thus becomes clear, according to which in Porto Rico, twigs of *C. alba*, Murr., are thrown on the water to narcotise fish in order that they may be easily caught.

Cassia (Leguminosae-Caesalpineae).

The leaves and also the seeds of *C. marylandica*, L., contain saponin; an extract froths at 1–500 and causes haemolysis at 1–125. In *Cassia* there are a number of data which point to the presence of saponin (*e.g.*, the employment of some as fish poison, of others as

insecticide, vermifuge, &c.) but the experimental proof is wanting in most cases. There is also a *C. venenifera*, Rodsch. (= *C. hirsuta*, L.), which still remains to be examined.

Castanospermum (Leguminosae-Papilionaceae).

The leaves of *C. australe*, A. Cunn. et Fraser, contain saponin, readily recognised by the strong frothing of an extract; I could not detect any saponin in the seeds.

The seed is edible but rather indigestible. Observations in Australia had already shown that the leaves are harmful to cattle. The saw-dust from the wood of *Castanospermum* greatly irritates the mucous membranes (saponin!). The roasted seeds are eaten as "Australian chestnuts."

Ceanothus (Rhamnaceae).

In the laboratory at Kew, I examined the leaves of four species, viz., *C. azureus*, Desf., *C. integerrimus*, Hook. et Arn., *C. thyrsiflorus*, Eschw., and *C. velutinus*, Dougl. They all contain saponin, most of all the two last mentioned. The young leaves, especially of the first two species, have an aromatic odour, owing to the presence of methyl salicylate; the leaves of *C. integerrimus* gave a mucilaginous extract. Saponin is also present in small quantity in the seeds of *C. americanus*, L., and *C. ovatus*, Desf.

Various species are used medicinally in America; thus the bark is used as a febrifuge. The root of *C. americanus*, L., is an antisyphilitic. In the species *C. reclinatus*, L'Hérit. (= *Rhamnus venosa*, Lam.), L'Hérit. earlier investigators found an alkaloid.

Cercis (Leguminosae-Caesalpineae).

The leaves of *C. canadensis*, L., and *C. chinensis*, Bunge, yielded tannin and saponin.

In the literature it is only mentioned that the leaves and seeds of the Judas tree (*C. Siliquastrum*, L.), which are free from saponin, serve as an astringent, and that the bark of *C. canadensis*, L., is employed against diarrhœa. According to Engler and Prantl, the acrid leaves of *C. Siliquastrum*, L., are eaten as salad and the buds as capers.

Cercocarpus (Rosaceae).

The leaves of *C. parvifolius*, Nutt., were found to contain much hydrocyanic acid.

No species of this genus (all from Mexico and California) had previously been investigated in a laboratory. They must undoubtedly be henceforth reckoned among poisonous plants.

Choisya (Rutaceae).

The aromatic bitter leaves of *C. ternata*, H.B. et K., deserve closer chemical investigation, for they contain an alkaloid, a volatile oil, and a little saponin. The crystalline alkaloid can be set free by caustic soda and can then be extracted with ether.

Chrysosplenium (Saxifragaceae).

The foliage of *C. oppositifolium*, L., contains a little saponin. *C. alternifolium*, L., is considered poisonous to sheep.

Cinnamomum (Lauraceae).

It may here be noted that the fresh leaves of *C. Tamala*, Nees, were found at Kew to contain much camphor; like many *Lauraceae* they contained much mucilage, and they yield a frothing extract.

The presence of camphor in a few other *Cinnamomum* species besides the real camphor tree (*C. Camphora*, Nees), has already been observed, *e.g.* in *C. Parthenoxylon*, Meissn.

Clematis (Ranunculaceae).

At Kew there is a rich collection of this genus, and I was able to detect hydrocyanic acid in *C. Fremonti*, Wats., *C. integrifolia*, L., *C. lanuginosa*, Lindl. et Paxt., *C. orientalis*, L., *C. pseudoflammula*, Schmalh. (In the next report I hope to give quantitative determinations of the hydrocyanic acid content, made in another season than that of my visit in August, 1909.) The presence of HCN in *C. recta*, L., is still somewhat doubtful; the leaf of this plant contains much methyl salicylate.

Saponin is of widespread occurrence in this genus; I found it in the leaves of *C. æthusiaefolia*, Turcz., *C. Bergeroni*, Lavall., *C. Buchaniana*, DC., *C. calycina*, Ait. (=*C. cirrhosa*, L.), *C. Flammula*, L., *C. Fortunei*, T. Moore (=*C. Williamsii*, A. Gray), *C. Fremonti*, Wats. (together with HCN), *C. Hendersonii*, Hort. (=*C. reticulata*, Walt.), *C. grata*, Wall., *C. integrifolia*, L., *C. lanuginosa*, Lindl. et Paxt. (together with HCN), *C. orientalis*, L. (together with HCN), *C. Pitcheri*, Torr. et Gray, *C. recta*, L. (*see* above), *C. Vitalba*, L., and *C. Viticella*, L. It may further be remarked that the leaves of *Clematis* are blackened in water, evidently owing to a strong ferment action on the tyrosine present.

The leaves of almost all the species are known as acrid and poisonous. In the genus *Ranunculus*, HCN was first observed by Fitschy in 1906, and in *Thalictrum* by van Itallie in 1905.

Cobaea (Polemoniaceae).

The leaves of the well-known ornamental plant *C. scandens*, Cav., were found to contain much saponin; an extract of the seeds froths only at 1–400 and haemolyses at 1–200.

Combretum (Combretaceae).

The leaf of *C. bracteosum*, Brandis, contains some saponin. The genus contains several colonial medicinal plants. The young leaves of *C. racemosum*, Beauv., and the fruit of *C. trifoliatum*, Vent., are used as an anthelmintic; the seed of *C. phaneropetalum*, Bak., is also used as a taenifuge, but in large doses it is toxic. The fruit of *C. erythrophyllum*, Sond., is known to be poisonous. The species examined is called in South Africa "Hiccup nut" because when eaten it causes persistent hiccup.

Cormus (Rosaceae).

The small ornamental shrub *C. foliolosa*, Franch., in Kew Gardens develops a strong odour of oil of bitter almonds on merely rubbing the leaves, and afterwards hydrocyanic acid and benzaldehyde were demonstrated with certainty.

Cormus is placed in the division *Sorbus* of the genus *Pyrus*. The plant may be said to be cyanogenetic "par droit de naissance."

Cortaderia (Gramineae).

The grasses *C. conspicua* (*Arundo conspicua* Forst.), and *C. Kermesiana*, (a variety of *C. argentea*), are very poisonous on account of a high content of hydrocyanic acid; they are moreover avoided by cattle on account of their hardness.

In 1906 Fitschy found hydrocyanic acid in the well-known Pampas Grass *C. argentea*, Stapf (*Gynerium argenteum*, Nees), an observation which I have confirmed. There is no indication that the true *Gynerium*, H. et B. contains hydrocyanic acid. Of late years a number of grasses have been found, some in my own laboratory, which are poisonous owing to the presence of HCN. *See* the summary under *Stipa*.

Cortusa (Primulaceae).

The leaf of *C. Matthioli*, L., contains saponin, which is of general occurrence in this order. Popular medicine prescribes this species for lithiasis, ischias, &c.

Cucumis (Cucurbitaceae).

The foliage of *C. metuliferus*, E. Mey., gives a strongly frothing extract and contains saponin. I also found this substance in the seeds of *C. dipsaceus*, Ehrenb., and *C. Sacleuxii*, Hort.

The seed of cucumbers and pumpkins is much sought after as a remedy against tape-worm and oxyurus. Perhaps this depends on the saponin which I also found in the seeds of *Lagenaria vulgaris*, Ser., and *Cucurbita maxima*, Duchesne.

Cystopteris (Filices-Polypodiaceae).

The foliage of *C. alpina*, Desv., *C. bulbifera*, Bernh., and *C. fragilis*, Bernh., contains a glucoside which yields on hydrolysis hydrocyanic acid and benzaldehyde. The odour of oil of bitter almonds is especially intense in the young leaves of *C. fragilis*, Bernh. ; there is also a trace of HCN in the spores.

Probably the odour of this fern has been noticed before, and this is the reason why *C. fragilis*, is mentioned as a popular remedy (Dragendorff, l.c. p. 56). While I was investigating *Cystopteris*, in the Jodrell laboratory I received a postcard from H. Woynar, of Graz, who wrote to me in connection with my publication on transitory hydrocyanic acid in *Pteris aquilina*, L., and some other ferns as follows : " Vielleicht interessirt die Mitteilung, dass alpine *Cystopteris*-arten, namentlich *C. montana*, Bernh., den intensivsten Blausäure-geruch zeigen, Rhizom und Blatt. Ich beobachtete dies in den Nord-Tiroler Alpen, sowohl in den nördlichen Kalkalpen (Lias) als auch im Schiefergebirge auf altem zum Dyas gehörigem Kalk (Dolomit)."

Davallia (Filices-Polypodiaceae).

The fern leaves of *D. brasiliensis*, Hk., *D. elegans*, Sw., *D. hirta*, Kaulf., *D. majuscula*, Lowe, *D. pentaphylla*, Bl., and *D. strigosa*, Sw., examined by me at Kew, were found to be distinctly cyanogenetic. The intensely bitter taste is remarkable, especially in the young foliage of *D. pentaphylla*, Bl. The most abundant formation of HCN was in the form cultivated as "*elegantissima*" and in *D. strigosa*, Sw., in which the formation of benzaldehyde was also observed. In the foliage of some other species HCN could not be detected ; *D. heterophylla*, Sm., and *D. marginalis*, Bak. (= *Microlepia marginata*, C. Chr.), give a frothing extract, *D. rhomboidea*, Wall. (= *Microlepia trapeziformis*, Kuhn), a mucilaginous one. The spores of *D. trichosticha*, Hk., and *D. platyphylla*, Don (= *Microlepia platyphylla*, J. Sm.), also give clear

indications of saponin: the extract frothed a good deal and had an acrid taste.

Davallia is an addition to the as yet small number of cyanogenetic ferns which have become known since my discovery of HCN in *Pteris aquilina*, L., in 1908. Notes on *Davallia* as drug or poison are rare; the foliage of *D. trifoliata*, Sw., is regarded as a diuretic and expectorant and is used in the West Indies in lung disease.

Deutzia (Saxifragaceae).

The leaf of *D. staminea*, R. Br., yields a bitter extract which froths strongly and contains saponin. In *D. corymbosa*, R. Br. (= *C. parviflora*, Bunge), and *D. Vilmorinae*, Lemoine et Bois, the leaf only contains tannin. The discovery of saponin in this genus is confirmed by the investigation of the leaves of *D. gracilis*, Sieb., and *D. setchuenensis*, Franch., which also proved to contain saponin. In the seeds of *Deutzia*, no saponin was found.

Although it is a well-known genus of ornamental shrubs, no species of *Deutzia* had as yet been submitted to analysis.

Deyeuxia (Gramineae).

The grass *D. Langsdorffii*, Kunth, contains saponin. A systematic investigation of the distribution of saponin in Grasses would be worth while; according to numerous laboratory notes which I made at Haarlem this substance seems to be of rather wide-spread occurrence in the leaves of grasses.

The roots of *D. Halleriana*, Vasey, are considered a diuretic.

Diervilla (Caprifoliaceae).

The leaves of *D. japonica*, DC., contain saponin; the seeds not. The plant under examination has long been recorded as poisonous. In N. America the stem of *D. trifida*, Moench., is used in the same way as Sarsaparilla.

Dimorphotheca (Compositae).

D. Ecklonis, DC., contains much hydrocyanic acid. In the leaf of this plant and in the seed of *D. pluvialis*, Moench., I found much saponin.

This genus was first recognised as cyanogenetic by Couperot in 1908; he examined *D. pluvialis*, Moench., in the leaves of which I too found HCN at Kew, both in the plants cultivated under that name and in the variety *D. hybrida*, DC. At present the following *Compositae* are known to contain hydrocyanic acid: *Anacyclus*, *Anthemis*, *Aplotaxis*, *Centaurea*, *Chardinia*, *Cirsium*, *Cladanthus*, *Dimorphotheca*, *Pyrethrum*, *Xeranthemum*.

Dionaea (Droseraceae).

In a few leaves of the celebrated little plant *D. muscipula*, L., I was able to demonstrate hydrocyanic acid with certainty, even with Guignard's test. Further investigation is pretty well excluded, on account of the rarity of the material in Europe.

Dionaea shows its relationship to *Drosera* also chemically. Hitherto laboratory observations on *Dionaea* only referred to the "eating" of insects by this plant. From the Palmengarten at Frankfurt a-M., I received material of another rare Droseracea, namely *Drosophyllum lusitanicum*, Link. This plant was also found to contain appreciable quantities of hydrocyanic acid.

Dirca (Thymelaeaceae).

The leaf of *D. palustris*, L., contains saponin. The species in question has for a long time been suspected; the acridity of its taste was noted as equal to that of *Daphne*; the plant is described as an emetic and narcotic.

Discaria (Rhamnaceae).

The leaf of *D. serratifolia*, Benth. et Hook., contains much saponin. On account of the supposed remedial action in fever an American species has been called *D. febrifuga*, Mart. The allied plant *Colletia spinosa*, Lam., is said to contain saponin.

Drimys (Magnoliaceae).

In May, 1909, I found that the leaves, and especially the flowers of *D. Winteri*, Forst., received from the University Botanic Gardens at Leiden, contained hydrocyanic acid. Afterwards I was able to confirm this with material from the gardens at Amsterdam, and at Kew. In the latter gardens I also had at my disposal a small branch of *D. aromatica*, F. Muell., it contained considerably more HCN than the first-mentioned species. The leaves of both species of *Drimys*, have an exceedingly acrid taste and cause a burning sensation on the tongue, the extract (especially of *D. aromatica*), froths strongly and contains much tannin. The odour of the ethereal oil resembles that of fennel and of cinnamon.

It is the source of the long known "Cortex Winteranus."

Drosera (Droseraceae).

The leaf of *D. binata*, Labill., attracted my notice at Kew, on account of its acrid bitter taste. On investigation, a fairly considerable quantity of hydrocyanic acid was found to be present, but the amount of material was not sufficient to determine the form of combination of the liberated HCN. *D. rotundifolia*, L., and *D. intermedia*, Hayne, were also found to contain a little HCN.

In the case of *Drosera*, popular observation has once more preceded experimental investigation, for several species (*D. communis*, St. Hil., *D. filiformis*, Raf., *D. peltata*, Sm., *D. stolonifera*, Endl.), are regarded as toxic and harmful to cattle. Thus *D. communis*, St. Hil., is known to be fatal to sheep, and the same is surmised in the case of *D. peltata*, Sm. Further investigation will be necessary in order to decide whether a special acrid principle is present in addition to the cyanogenetic one. The well-known *D. rotundifolia*, L., was formerly used in popular medicine in various countries and was again recommended some years ago as an excellent remedy for bronchitis, asthma, cough and whooping cough. Compare C. Hartwich: Die neuen Arzneidrogen aus dem Pflanzenreiche, 1897.

Erythronium (Liliaceae).

In the leaves of *E. purpurascens*, S. Wats., I found at Kew, saponin. I afterwards obtained at Haarlem, from the well-known nurseries of van Tubergen, fresh bulbs of the following ornamental plants: *E. Dens-canis*, L., *E. giganteum*, Lindl. (= *E. grandiflorum*, Pursh.), *E. revolutum*, Bak. (= *E. purpurascens*, S. Wats.). The extracts froth strongly but are only slightly poisonous judging by the feeble haemolysis.

The bulb of *E. Dens-canis*, L., is used as an anthelmintic, *E. americanum*, Ker-Gawl., is considered an emetic and expectorant. All these applications undoubtedly depend on the saponin content. According to Engler and Prantl the boiled bulbs of *E. americanum*, L., are eaten in North America.

Eurotia (Chenopodiaceae).

In the leaves of *E. ceratoides*, Mey., I found saponin. In this order saponin appears to occur very generally.

Exacum (Gentianaceae).

The leaves of *E. affine*, Balf., contain saponin. I cannot find any application or observation concerning this genus which points to the occurrence of saponin. Doubtless the bitter principles are more prominent here.

Forsythia (Oleaceae).

At Kew, I found a little saponin in the leaves of the hybrid *F. intermedia*, Zabel.; at Haarlem, also a little in the seeds of *F. suspensa*, Vahl.

In 1887, Eykman pointed out that there occurs in the leaf of *F. suspensa*, Vahl, a similar glucoside to that present in *Phillyrea*. This Chinese plant is *i.a.* recorded as a diuretic. Porter Smith says it is considered "slightly poisonous."

Galega (Leguminosae-Papilionaceae).

The leaves of *G. officinalis*, L., var. *alba*, give a strongly frothing extract and contain saponin. I found the same substance in smaller quantities in the seeds of *G. officinalis*, L., and of *G. orientalis*, Lam.; the former gives an extract frothing at 1–1000 and haemolytic at 1–125.

Galega was formerly used in pharmacy, *i.a.* as a diuretic. The genus is closely related to various plants used as fish poisons or known in other ways to be poisonous.

Gilia (Polemoniaceae).

G. aggregata, Spreng., contains saponin; the saponin is very poisonous. At Haarlem I found that an extract of the seeds of *G. laciniata*, Ruiz et Pav., only froths at 1–400, but still haemolyses at 1–800; in the seed of *G. achilleaefolia* these dilutions were 1–900 and 1–1000 (!), for that of *G. nivalis*, 1–200 and 1–500.

Saponin appears to occur generally in this order.

Gleichenia (Filices-Gleicheniaceae).

The foliage of *G. flabellata*, R. Br., is characterised by a high saponin content.

I only find recorded that the rhizome of *G. Hermanni*, R. Br., is used against asthma in Japan, and that of *G. dichotoma*, Hook., in Mauritius.

Halimodendron (Leguminosae-Papilionaceae).

In the leaves of *H. argenteum*, Fisch., a high saponin content was observed.

Heptapleurum (Araliaceae).

I found saponin in the leaf of *H. emarginatum*, Seem. Many saponin plants are found in this order. In 1897 at Buitenzorg, Plugge found saponin in *H. ellipticum*, Seem. (=*H. venulosum*,

Seem.), and in *H. scandens*, Hiern; according to further investigations of Boorsma (1902) this saponin is but slightly toxic. The leaf of *H. rigidum*, Seem., is used *i.a.* as a diuretic. Saponin is known in various other *Araliaceae* (*Aralia*, *Panax*, *Polyscias*, *Trevesia*).

Hydrangea (Saxifragaceae).

In *Hydrangea* there is a clear example of "transitory hydrocyanic acid," such as I have also demonstrated in ferns. In 1908 and 1909 I sometimes found considerable quantities of hydrocyanic acid in the well-known ornamental plant, *H. Hortensia*, Sieb., and sometimes I did not. Probably the cyanogenetic principle disappears from the leaves in autumn; in any case the young leaves contain much more HCN than the older ones. In adult leaves of *H. Lindleyana*, which is considered a variety of *H. Hortensia*, Sieb., and in *H. Thunbergii*, Sieb., the content may amount to 0·04 per cent. and the odour of benzaldehyde is observable on hydrolysis. At Kew I carefully examined eight species of *Hydrangea* but only found HCN in one of these (*H. Thunbergii*, above mentioned). I found that the hydrolysis of the glucoside takes place very slowly; apparently the leaves contain but little enzyme. The very sweet taste of this leaf is remarkable. Apart from the species mentioned I once found hydrocyanic acid in the foliage of *H. involucrata*, Sieb.; the Guignard reaction, repeated with other material of the same species, was however negative; the extract frothed strongly.

Hydrocyanic acid had not yet been found in this genus; in the bark of *H. arborescens*, L., saponin was discovered in 1887.

Isopyrum (Ranunculaceae).

A small quantity of seed obtained from a plant of *I. fumarioides*, L., grown at Kew was found to contain a little hydrocyanic acid. The investigation should be continued.

Isopyrum is related to cyanogenetic genera.

Jamesia (Saxifragaceae).

The leaves and stems of *J. americana*, Torr. et Gray, contain an appreciable amount of hydrocyanic acid. The liberation of HCN in the leaf, bruised with water, only took place very slowly; probably the leaf contains but little enzyme.

No details are known concerning the applications of this species —the only one of the genus—a shrub of the Rocky Mountains.

Kageneckia (Rosaceae).

The leaves of *K. angustifolia*, D.Don, when bruised with water, freely develop hydrocyanic acid and benzaldehyde, they must therefore contain a cyanogenetic glucoside of the amygdalin type, but the *extremely bitter* taste, which cannot be caused by amygdalin, is very remarkable. In Kew a second species of this genus is cultivated, namely *K. oblonga*, Ruiz et Pav., from Chili. According to my analysis this species also contains much hydrocyanic acid, and its taste is also very bitter. This remarkable bitterness has not escaped previous observation, for in Bentham and Hooker, Gen. Plant. I, 614, it is stated explicitly in the description, "Semina *K. oblongae*, amarissima."

There are only three species of this genus, found in Chili and Peru. The leaves of *K. oblonga*, and of *K. lanceolata*, Ruiz et Pav., are used in their native country against fever. As in so many cases this popular usage doubtless depends on the bitter taste of the leaves, and presupposes the presence of quinine; in this case the error might prove fatal.

Knightia (Proteaceae).

The leaf of *K. excelsa*, R. Br., contains saponin and, in addition, much tannin.

Kochia (Chenopodiaceae).

The leaf of *K. scoparia*, Schrad., contains saponin, as do the seeds of this species and of *K. arenaria*, Roth. The seeds of *K. trichophylla*, Hort., yielded an extract which frothed up to a dilution of 1–700 and caused complete haemolysis at 1–250. *Kochia* is now a much esteemed ornamental plant known as "Summer cypress." The species examined is used to some extent as a popular remedy in Southern Europe, *e.g.*, as a diuretic.

Liriodendron (Magnoliaceae).

The leaves of *L. tulipifera*, L., contain small quantities of two special substances: hydrocyanic acid and saponin. Both are also present in the rare Chinese Tulip tree, *L. chinense*, Sarg.

It is remarkable that the chemical nature of such a well-known tree had hitherto escaped attention; Lloyd, in 1886, indeed found an alkaloid (?) in the bark, and there are some vague indications of the toxicity of *L. tulipifera*, L. Various parts are used as a drug.

Lonicera (Caprifoliaceae).

It can easily be shown that saponin is widely distributed in this genus. Partly at Haarlem, and partly at Kew, I found it in the leaves of *L. japonica*, Thunb., *L. Ledebourii*, Eschsch. (= *L. involucrata*, Banks)—an extract froths at 1–2000,—*L. Morrowi*, Gray (=*L. chrysantha*, Turcz.), *L. Standishii*, Hook., *L. tatarica*, L., *L. tomentella*, Hook. et Thoms., *L. Xylosteum*, L. The haemolytic power of *Lonicera* saponin is slight. The commonest species, *L. Caprifolium*, L., contains but little saponin in its leaves and none in the berries

Compare in this report: *Abelia*, *Diervilla*, *Symphoricarpus*.

Lucuma (Sapotaceae).

At Kew, I was able to examine two leaves of the species *L. deliciosa*, Planch., and *L. mammosa*, Gaertn. Both yielded hydrocyanic acid, the latter the larger quantity. Benzaldehyde is also formed in the hydrolysis of the glucoside. At Haarlem, I detected hydrocyanic acid in the seeds of *L. multiflora*, A. DC., from Porto Rico.

Lucuma forms a well-known genus of West Indian fruit trees. In *L. Bonplandia*, H.B. et K., Altamirans demonstrated amygdalin as early as 1876, and in other species a cyanogenetic glucoside was suspected, but the experimental proof was wanting. This proof has now been supplied for *L. mammosa*, Gaertn., in particular, for which plant Peckolt had doubted the formation of benzaldehyde (compare Dragendorff, l.c. p. 519).

Macadamia (Proteaceae).

A well-known Australian plant, *M. ternifolia*, F. Muell., the "Queensland Nut," must, according to my analysis at Kew, be considered among the most strongly cyanogenetic plants; in the fresh leaf the HCN content was more than 0·1 per cent.

Our chemical knowledge of this order is still very slight.

Michelia (Magnoliaceae).

The leaf of *M. fuscata*, Bl., has an astringent bitter taste. The bitternèss was found to be due to an alkaloid, present in considerable quantity. In the filtered aqueous decoction, the general alkaloidal reagents such as picric acid, iodine and Mayer's reagent, and also mercuric chloride, produce heavy precipitates. I have prepared the alkaloid in the pure state according to the method of Stas-Otto; it is soluble in excess of ammonia.

At Buitenzorg, Eykman found an alkaloid in *M. parvifolia*, Bl., in 1885, and I myself found one in *M. Champaca*, L., in 1890. See Mededeelingen uit 's Lands Plantentuin, xxv., p. 4.

Napoleona (Myrtaceae).

The leaf of *N. Whitfieldii*, Van Houtte, was found to contain saponin.

The genus has been included in *Myrtaceae* and in *Lecythidaceae*; in the latter order saponin is of general occurrence.

Nicodemia (Loganiaceae).

The leaf of *N. diversifolia*, Ten., has a high saponin content. The genus is closely related to *Buddleia*, which has long been known to contain saponin and to be poisonous.

Oldenburgia (Compositae).

The leaf of *O. Arbuscula*, DC., contains saponin in addition to tannin.

Olearia (Compositae).

The herb *O. macrodonta*, Bak., was found to contain saponin. *Olearia* (= *Eurybia*, Cass.) is closely related to *Aster* and to *Erigeron*.

Oxytropis (Leguminosae).

The young leaf, especially of *O. lapponica*, Gaud., has an extremely bitter taste; there is also an indication of saponin. On analysis, the leaf was found to contain hydrocyanic acid. At Haarlem, I found hydrocyanic acid in the seeds of *O. sulphurea*, Fisch. *Oxytropis* is closely related to *Astragalus*. Of the many species but little is known economically. Some (*O. pilosa*, DC., *O. uralensis*, DC.), are used as a popular remedy in their native country. One species, *O. Lambertii*, Pursh., is known as poisonous in Mexico, and there belongs to the ill-famed "loco-weeds." Whether this species also owes part of its toxicity to hydrocyanic acid and part to saponin, has still to be investigated. In California also a poisonous member of this genus is known as "loco-weed."

Paliurus (Rhamnaceae).

If the foliage of *P. australis*, Gaertn. (= *P. aculeatus*, Lam.), is bruised, a strong odour of methyl salicylate may be observed. Among native plants I only know *Monotropa Hypopitys*, L., as containing oil of winter green to the same extent.

Paronychia (Illecebraceae).

P. capitata, Lam., must be considered as containing saponin. The seed of *P. bonariensis*, DC., examined at Haarlem, also contained saponin ; the haemolytic power of the extract was 1–100.

Peraphyllum (Rosaceae).

The leaf of *P. ramosissimum*, Nutt., contains a glucoside which in hydrolysis sets free hydrocyanic acid and benzaldehyde.

This species was formerly described as *Amelanchier* ; the occurrence of hydrocyanic acid is therefore not surprising.

Philadelphus (Saxifragaceae).

Saponin appears to be distributed in this genus. I found it in the leaves of *P. coronarius*, L., *P. Lemoinei* and *P. microphyllus*, A. Gray ; it was, however, absent from the leaves of some other species. I found saponin in the seeds of the following : *P. grandiflorus*, Willd., *P. Lewisii*, Pursh., and *P. tomentosus*, D. Don, which are, moreover, considered in the *Index Kewensis* as synonyms of *P. coronarius*, L. In *P. grandiflorus*, Willd., the saponin content is highest ; an extract of the seeds froths at 1–2000 and haemolyses at 1–700.

Phillyrea (Oleaceae).

The leaves of *P. media*, L., contain saponin, but in the seeds only traces are present.

Various species are used as popular remedies in S. Europe, *e.g.*, the leaves as diuretic and as febrifuge.

Phytolacca (Phytolaccaceae).

The leaves of *Phytolacca* species have a noticeably acrid taste and burn the tongue. I found that *P. acinosa*, Roxb., *P. bogotensis*, H. B. et K., and *P. decandra*, L., all contain saponin as the acrid principle. I also examined the seeds and roots of *P. decandra*, L., *P. dioica*, L., *P. Kaempferi*, A. Gray (= *P. acinosa*, Roxb.), and found both organs to contain saponin ; although the extracts froth very strongly, the haemolytic power is small, less than 1–100.

Phytolacca is known as a genus of acrid and toxic plants and various popular observations and remedial uses have been recorded with relation to it. Thus *P. decandra*, L., is considered a purgative, emetic, antisyphilitic and taenifuge—all of which is doubtless connected with the saponin content. *P. icosandra*, L., and *P. octandra*, L., are indeed used like soap. From the poisonous root of the Abyssinian species of *Phytolacca* (or of the closely related genus *Pircunia*, Bort.), which is used in its native country against tape-worm, a poisonous saponin had already been prepared. In this species saponin is extraordinarily abundant ; I found that an extract of the fruits of *P. abyssinica*, Moq., still frothed at 1–15000, and haemolysed at 1–700. Other toxic principles, insufficiently known, appear, however, also to occur in the genus *Phytolacca*.

Pittosporum (Pittosporaceae).

At Kew I was able to examine various species of this genus. Saponin was found in the leaves of *P. cornifolium*, A. Cunn., *P. crassifolium*, Soland., *P. erioloma*, C. Moore et F. Muell., *P. eugenioides*, A. Cunn., *P. Huttonianum*, Kirk, *P. rhombifolium*, A. Cunn., *P. Tobira*, Ait., *P. undulatum*, Vent. Tannin is also present in these

leaves. The cause of the persistent bitter taste, possessed especially by *P. Buchanani*, Hook., *P. eugenioides*, A. Cunn., *P. rhombifolium*, A. Cunn., and *P. undulatum*, Vent., has not yet been investigated ; an alkaloid is only present in traces. *Billardiera longiflora*, Labill., closely allied to *Pittosporum* also contains saponin.

At Haarlem I found saponin a good many years ago in the leaves of *Pittosporum Tobira*, from the University Botanic Garden at Leiden.

The fruits of *P. phillyraeoides*, DC., yielded an extract frothing at 1–4000 and haemolytic at 1–1500. The dry leaf of *P. undulatum*, even gives an extract frothing at 1–1200, with haemolysis at 1–1500.

The fairly common occurrence of saponin in this natural order has already been repeatedly remarked. Some species (*P. coriaceum*, Ait., *P. viridiflorum*, Sims), are even known as soap-substitutes in their native countries. The use of *P. javanicum*, Bl., as a fish-poison doubtless also depends on the high saponin content of this plant. The saponin of *P. undulatum*, Vent., was examined in London in 1904 by Miss Hooper, and the essential oil in 1906 by Power (*Pharm. Journ.* 1904, 588 ; 1906, 755).

Platanus (Platanaceae).

In the spring of this year (1909) I first observed that the young foliage of the plane-tree undoubtedly contains hydrocyanic acid : I distilled it and converted it into Prussian blue. The quantity is not large and when the leaves grow older the HCN content falls off to small traces. The hydrocyanic acid is not combined with benzaldehyde, but probably with acetone. At Kew I was able to analyse side by side four species of *Platanus* and to confirm all my earlier observations : *P. acerifolia*, Willd. (also regarded as a variety of *P. orientalis*, L.), *P. cuneata*, Willd., *P. occidentalis*, L. and *P. orientalis*, L. In all of these HCN occurs especially in the young leaf ; in *P. cuneata*, Willd., the largest amount was found, *i.e.* about 0·05 per cent. Indeed, in the ordinary plane-tree of the London streets (*P. acerifolia*), there is so much hydrocyanic acid present that the amount from every London plane-leaf would be enough to kill a London sparrow.

As far as I am aware *Platanus* was not known to have any other harmful property than that the bristly hairs of the fruit may cause on inhalation the so-called plane-cough.

Polemonium (Polemoniaceae).

At Kew the leaves of *P. reptans*, L., were found to contain saponin. At Haarlem I also examined the seeds of *P. boreale*, Adams, *P. flavum*, Greene, *P. gracile*, Willd., *P. pauciflorum*, S. Wats., and *P. Richardsonii*, R. Grah. (= *P. humile*, Willd.), and found that they all contain saponin, indeed in large quantities : haemolysis with all species at about 1–300.

The genus *Polemonium* has hitherto not been examined chemically, or hardly so. The shoot of *P. caeruleum*, L., is used as antisyphilitic and the root of *P. reptans*, L., as a diuretic.

Potentilla (Rosaceae).

The leaf of *P. davurica*, Nestl. (a variety of *P. fruticosa*, L. ?), a plant from China, cultivated at Kew, is characterised by its pure

and powerful odour of roses. Although the odour of roses (or geraniol) is not particularly rare among plants (the rose-like scent of young Willow foliage is well known and is especially noticeable in *Salix babylonica*, L., and *S. elegantissima*, C. Koch), I know no other plant which has such an intense rose-scent as this Potentilla leaf. In the Jodrell laboratory I prepared from it an "aqua rosarum" of good quality. The leaves of this species of *Potentilla* are said to be used in Russia instead of tea.

Prosopis (Leguminosae-Mimoseae).

The leaf of *P. juliflora*, DC., contains saponin. An extract of the seeds only frothed at 1–200 and haemolysed at 1–125.

The bark of *Enterolobium cyclocarpum*, Griseb., had already been noted as containing saponin. The pods of the species examined are considered poisonous to cattle.

Protea (Proteaceae).

The leaf of *P. cynaroides*, L., bruised with water, sets free a small quantity of hydrocyanic acid. In my second Kew report I hope to give further details about this plant.

The natural order *Proteaceae* is still a "terra incognita" for the chemist. The case of *Macadamia*, mentioned in the present report, is evidently not an isolated one, and there is reason to suspect the presence of hydrocyanic acid in other genera also (*e.g.*, *Brabejum*, *Helicia*).

Psoralea (Leguminosae-Papilionaceae).

I have examined the leaf of *P. macrostachya*, DC., at Kew and the seeds at Haarlem; both contained saponin, especially the leaf.

Many members of this suborder contain saponin. The root of *P. glandulosa*, L., acts as an emetic and the leaves for instance are used as an anthelmintic. *P. tenuiflora*, Pursh., is regarded as poisonous and is avoided by cattle.

Ptelea (Rutaceae).

The leaf of *P. trifoliata*, L., contains saponin but I did not detect any in the seed.

The leaves of the species examined are used in North America as an anthelmintic.

Roupala (Proteaceae).

The leaf of *R. Pohlii*, Meissn., contains saponin; a smaller amount also occurs in that of *R. Vervaineana*, Hort. (a variety of *R. elegans*, Pohl?): in addition leaves of both contain tannin.

Ruscus (Liliaceae).

The foliage, but not the seeds, of *R. aculeatus*, L., must be noted as containing saponin.

The species examined has *i.a.* been regarded as an abortive; in former times, and even now in some countries, it is much in request as a remedy, *e.g.*, as diuretic (and also a substitute for sarsaparilla). The same virtue is ascribed by Arabian physicians to the leaves of *R. Hypoglossum*, L., and *R. Hypophyllum*, L.

Saururus (Saururaceae).

The leaf of *S. lucidus*, Donn (= *S. cernuus*, L.), contains saponin. This natural order is closely related to *Piperaceae* where

saponin has also been found (in *Piper Palmeri*, C. DC.) The root of the species examined is called in North America "black sarsaparilla."

Saxifraga (Saxifragaceae).

None of the twelve species of *Saxifraga* which I examined at Kew contain hydrocyanic acid, but they all contain much tannin. Saponin is present in the leaves of *S. Andrewsii*, Harv., *S. cortusaefolia*, Sieb. et Zucc., *S. cuneifolia*, L., *S. Sibthorpii*, Boiss. A strongly mucilaginous extract is given by *S. Fortunei*, Hook.

But little is known chemically of this genus and the medicinal applications are small. As regards the popular use of some species as lithontriptic we must bear in mind the naïve confusion which transfers the stone-breaking properties from which the genus derives its name, to the "stone" in the human body.

Securinega (Euphorbiaceae).

In a single leaf of *S. ramiflora*, Muell. Arg., I was able to demonstrate hydrocyanic acid by Guignard's reaction. The examination will have to be confirmed and supplemented in India; in Europe sufficient material is not available.

The discovery of hydrocyanic acid in this genus is particularly important, because it promises an explanation of the employment of the bark of the British-Indian species *S. Leucopyrus*, Muell. Arg., as a narcotic fish-poison (Roxburgh) and the use of its leaves as an insecticide (Dymock).

Spiraea (Rosaceae).

The leaf of *S. japonica*, L., contains saponin; that of *S. ramtschatica*, Pall., contains much tannin, that of *S. digitata*, Willd., (=*S. palmata*, Pall.), both tannin and saponin. Previously at Haarlem I had already detected saponin in the seeds of *S. Aruncus*, L., *S. bella*, Sims, *S. canescens*, D. Don, *S. Humboldtii*, Hort., *S. laevigata*, L., and *S. palmata*, Pall.

The genus shows a great diversity as regards chemical constituents. Some few species contain hydrocyanic acid; saponin also had already been observed.

Stipa (Gramineae).

As a result of an examination at Kew, the following species can be added to those known to contain hydrocyanic acid: *S. Lessingiana*, Trin. et Rupr. (=*S. pennata*, L.?), and at Haarlem *S. capillata*, L. (according to Dr. O. Stapf a form of *S. gigantea*, Lag.).

The violent toxic action of some species had been known for a long time, but not until 1904 was HCN pointed out as the cause of this toxicity by Hébert and Heim. Various species are now recognised as cyanogenetic belonging to the genera: *Briza*, *Catabrosa*, *Cortaderia*, *Elymus*, *Festuca*, *Glyceria*, *Holcus*, *Lamarckia*, *Melica*, *Panicum*, *Poa*, *Sorghum*, *Stipa* and *Zea*.

Symphoricarpus (Caprifoliaceae).

The leaf of *S. mollis*, Nutt., examined at Kew, was found to contain saponin. At Haarlem I examined the leaves of the ordinary snowberry, *S. racemosus*, Michx., and found that these also contain saponin, but the fruits do not.

The stem of *S. orbiculatus*, Moench., is used in N. America as a diuretic. It is of interest to note that cases of poisoning with *S. racemosus*, Michx., have repeatedly occurred.

Tetragonia (Ficoideae).

The shoots of *T. expansa*, Murr., contain much saponin but not the seeds.

Saponin had previously been found in this order in *Trianthema*. Presumably the saponin of *Tetragonia* is but slightly poisonous, as it is used as a vegetable; in boiling the leaves, the saponin would moreover in general be removed with the water.

Thymus (Labiatae).

In 1905 I pointed out in the Dutch journal "De Levende Natuur" that two varieties of *Thymus Serpyllum*, L., occur in the Dutch sand dunes which can be readily distinguished externally, and which are sharply differentiated phytochemically by the fact that one variety (the common one) forms thymol in its leaves and accordingly smells like this substance, whereas the other always forms citral and consequently has a strong odour of lemons, quite different from the ordinary scent of thyme. At Kew I found *Thymus Serpyllum*, L., var. *album*, in cultivation and noticed that this also forms citral, and not thymol.

Trollius (Ranunculaceae).

The leaves of *T. pumilus*, D. Don, and *T. chinensis*, Bunge (= *T. asiaticus*, L.), contain saponin.

T. europaeus, L., is considered poisonous, and saponin was found in it in my laboratory at Haarlem by Dekker in 1906.

Umbellularia (Lauraceae).

The leaf of *U. californica*, Nutt., was found to be feebly cyanogenetic. If the leaf be rubbed to a pulp with water, an evolution of HCN not only takes place, but one can also observe more readily that the leaf contains an ethereal oil of strong odour, and further that it forms with water a very mucilaginous jelly of an intensely black colour. The leaves are also coloured black on drying.

The species examined is used medicinally in N. America (*cf.* Dragendorff, l.c. p. 244) and according to a recent report (of Chesnut, 1902) also as an insecticide. What insect would be proof against the combined action of hydrocyanic acid, terpene and an alkaloid, to say nothing of the strong oxydase?

Viburnum (Caprifoliaceae).

The leaf of *V. macrophyllum*, Thunb., contains saponin. Some applications of this genus point to saponin being probably widely distributed in it (*cf.* Dragendorff, l.c. p. 641). Thus *V. Opulus*, L., is recorded as an emetic.

Xanthisma (Compositae).

The leaf of *X. texanum*, DC., yields a frothing extract and contains saponin.

Nothing was known regarding the constituents of this genus.

Xylomelum (Proteaceae).

The leaf of *X. pyriforme*, Knight, contains saponin.

LX.—DIAGNOSES AFRICANAE: XXXIII.

1061. **Jasminum Wyliei**, *N.E. Brown* [Oleaceae]; affinis *J. abyssinico*, R. Br., sed paniculis laxis et pedicellis multo longioribus facile distinguitur.

Frutex ramosus, ramis patentibus glabris. *Folia* pinnatim 3-foliolata, glabra, foliolis lateralibus 2·5–3·5 cm. longis 1·6–2·3 cm. latis late ovatis, intermedio 2·5–4·8 cm. longo 2·3–3·6 cm. lato suborbiculari, omnibus breviter acuminatis obtusis vel acutis basi latissime cuneatis glabris. *Paniculae* terminales, subcymosae, 6-7 cm. longae, 8-10 cm. latae, 10–16-florae vel racemi axillares 5–6-flori, laxi, minutissime puberuli. *Bracteae* 2–7 mm. longae, subulatae. *Pedicelli* 7–18 mm. longi. *Calyx* campanulatus, 3 mm. longus, 3 mm. latus, breviter 5–6-dentatus, dentibus 0·3–0·5 mm. longis, minutissime puberulus. *Corolla* 5–6-loba, glabra, alba; tubus 2–2·3 cm. longus, basi 2 mm. diametro, apice 4 mm. diametro, superne gradatim ampliatus; lobi patentes, 1 cm. longi, 5–7 mm. lati, oblongi vel ovati, obtusi.

Natal. Nkandhla, 1220–1520 m., *Wylie in Herb. Wood*, 8860.

1062. **Schizoglossum auriculatum**, *N. E. Brown* [Asclepiadaceae]: affinis *S. parco*, N. E. Br., sed floribus duplo majoribus et coronae loborum appendicibus brevioribus et tenuioribus differt.

Caules 35–45 cm. alti, 1·5 mm. crassi, subcompressi, ancipites, pubescentes vel puberuli, internodiis 5–8 cm. longis. *Folia* erecta, 2·3–4 cm. longa, 1–2 mm. lata, linearia, acuta vel subobtusa, marginibus revolutis, glabra. *Umbellae* ad nodos laterales, sessiles, 3–5-florae. *Pedicelli* 4–8 mm. longi, piloso-pubescentes. *Corolla* fere ad basin 5-loba, intus glabra, extra pilis paucissimis conspersa; lobi 3·5–4 mm. longi, 2–2·5 mm. lati, ovati, acuti, dorso late purpureo-marginati. *Coronae* lobi intus appendiculati, 1–1·3 mm. longi, 1·5 mm. lati, 3-dentati, dente intermedio late deltoideo-ovato obtuso, dentibus lateralibus parvulis auriculato-inflexis; appendix prope apicem lobi inserta, filiformi-subulata, 0·5–0·75 mm. longa, supra antheras inflexa, basi in carinas duas decurrens.

Natal. Near Howick, 915–1220 m., *Wood*, 5385.

1063. **Schizoglossum decipiens**, *N. E. Br.* var. **flavum**, *N. E. Brown* [Asclepiadaceae]; a *S. decipiente*, N. E. Br., typico differt corolla viridiflava et coronae loborum corporibus in appendicibus confluentibus.

Natal. Niginya, 1520–1830 m., *Wylie in Herb. Wood*, 11206.

1064. **Sisyranthus Franksiae**, *N. E. Brown* [Asclepiadaceae]; affinis *S. compacto*, N. E. Br., sed caule duplo vel triplo longiore, foliis quam internodia brevioribus et coronae lobis supra antheras productis differt.

Caulis ad 0·75 m. altus, simplex, strictus, teres, glaber, internodiis 8–10 plerumque 10–12 cm. longis. *Folia* evoluta paribus 4–5, erecta, 3–9 cm. longa, 1–1·5 mm. lata, linearia, acuta, glabra, inferiora rudimentaria. *Umbellae* 3–4 ad apicem caulis in umbellam compositam 3 cm. diametro congestae. *Pedunculi* 0–1 cm. longi, parce patule pubescentes. *Pedicelli* 6–7 mm. longi, patule pubescentes. *Sepala* 2·5 mm. longa, lanceolata, acuminata, pubescentia. *Corolla* viridis, extra glabra; tubus 2–2·5 mm. longus,

intus ad faucem dense barbatus, infra glaber ; lobi 2 mm. longi, ovati, acuti, erecti, intus ubique pilis longis dense barbati. *Coronae* lobi 2 mm. longi, antheris multo longiores, late rhomboideo-ovati vel triangulari-ovati, subulato - acuminati, subula supra antheras inflexa, angulis lateralibus subacutis vel dentiformibus, glabri.

Natal. Near the mouth of the Matikulu River, *Wood*, 11208.

Named in honour of Miss Millicent Franks, the able assistant in the Natal Herbarium at Durban, who detected this as being a new species while making drawings of the dissections of all the Asclepiads in the Natal Herbarium for the use and benefit of future students. She has also prepared a large number of the plates published (under the initials M. F.) in Wood's *Natal Plants*.

1065. **Selago immersa**, *Rolfe* [Selagineae]; inter species floribus pedicellatis, pedicellis bracteis cuneatis adnatis et subimmersis distincta.

Fruticulus ramosissimus, 30 cm. longus vel ultra. *Ramuli* pubescentes, dense foliati. *Folia* fasciculata, cuneato-oblonga, acuta, apice incisa vel dentata, scabridula et ciliata, 3–4 mm. longa. *Spicae* numerosae, breves, densiflorae, circa 1 cm .longae. *Bracteae* cuneatae, subacutae, denticulatae, concavae, scabridulae, 3 mm. longae. *Pedicelli* bracteis omnino adnati et subimmersi, 1–1·5 mm. longi. *Calyx* campanulatus, 1 mm. longus, semi-5-fidus ; lobi oblongi, obtusi, ciliati. *Corolla* hypocrateriformis, alba ; tubus 3·5 mm. longus ; lobi orbiculari-elliptici, 2 mm. longi.

Natal. Giants Castle, 2400–3200 m., *Wylie in Herb. Wood*, 10665.

Remarkable for the complete union of the pedicel with the base of the broad concave bract, in which it appears to be immersed.

1066. **Stachys Cooperi**, *Skan* [Labiatae-Stachydeae]; affinis *S. grandifoliae*, E. Meyer, sed foliis parce molliter pubescentibus vel parcius hispidulis interdum infra fere glabratis, dentibus paucioribus (utrinque 12–15).

Caulis herbaceus, decumbens, tenuissimus, ramosus, 3–6 dm. longus, paulum molliter pubescens vel parce hispidulus ; rami ad 3 dm. longi vel ultra ; internodia 3–6 cm. raro ad 15 cm. longa. *Folia* petiolata, ovata, majora 4–5 cm. longa et 3–4 cm. lata, apice acuta vel obtusa, basi aperte profundeque cordata, regulariter crenata, parce et molliter pubescentia vel parcius hispidula, infra interdum fere glabrata, tenuissima ; dentes saepe utrinque 12–15, 1–2 mm. alti, 3–5 mm. lati ; petioli gracillimi, 1–4 cm. longi. *Bracteae* breviter petiolatae vel subsessiles, inferiores ovatae, calyce longiores, superiores lineari-lanceolatae calyce breviores. *Verticillastri* pauci, 6-flori, paulum remoti. *Pedicelli* brevissimi. *Calyx* campanulatus, 6–8·5 mm. longus, sat dense et molliter pubescens vel parce hispidulus ; dentes lineari-triangulares, 2·5–4·5 mm. longi, basi 1–2 mm. lati, saepe conspicue patentes, interdum apice aceroso curvati. *Corolla* alba, pubescens, tubo anguste infundibuliformi 6–9 mm. longo incurvato ; labium posterius ellipticum, 5–6 mm. longum, integrum, dorso carinatum ; labium anterius

8–9 mm. longum, lobo intermedio suborbiculari vel obovato 3·5–6 mm. longo 4–8 mm. lato.

Cape Colony. Albany Division; without precise locality, *Cooper*, 15: Transkei; Kentani District, in forests at 365 m., *Miss Alice Pegler*, 908.

1067. **Stachys malacophylla**, *Skan* [Labiatae-Stachydeae]; species *S. sessilifoliae*, E. Meyer, proxima, sed foliis petiolatis, corolla multo majori, tubo longe exserto recedit.

Caulis herbaceus, decumbens, simplex vel parce ramosus, 2–4 dm. longus vel ultra, gracilis, dense griseo-velutinus; internodia 1·5–6 cm. longa. *Folia* petiolata, late ovata, 1–1·5 cm. longa et lata, apice rotundata, basi late cordata, crebre crenulata, dense vel densissime griseo-velutina; petioli 4–14 mm. longi. *Bracteae* breviter petiolatae vel subsessiles, inferiores foliis similes sed minores, superiores gradatim reductae. *Verticillastri* pauci vel sat multi, 2–6-flori, remoti. *Pedicelli* circiter 1·5 mm. longi. *Calyx* campanulatus, circiter 6 mm. longus, dense griseo-velutinus; dentes deltoideo-lanceolati, circiter 1·5 mm. longi, acuminati, paulum spinescentes. *Corolla* roseo-lilacina, pubescens, tubo 8 mm. longo calyce multo longiori; labium posterius ellipticum, 4 mm. longum, integrum, concavum; labium anterius 6–7·5 mm. longum, lobo intermedio suborbiculari 3 mm. longo circiter 4 mm. lato.

Cape Colony. Queenstown Division; Queenstown, 1220 m., *Galpin*, 1955; Hangklip Mountain, 1920–1980 m., *Galpin*, 5891.

Mr. Galpin describes the colour of the flowers as mauve. His specimen 5891 is much less densely grey-velutinous than the other cited.

1068. **Boerhaavia bracteata**, *T. Cooke* [Nyctaginaceae]; a *B. repente*, L., pilis horizontaliter patentibus, paniculae ramis fasciculatis et bracteis magnis differt.

Suffrutex erectus. *Caulis* teres, pilis horizontaliter patentibus villosus, infra lignosus. *Folia* late ovata, obtusa, petiolata, 3–7 cm. longa, 2–6 cm. lata, plus minusve nervis pilosa et margine ciliata, basi rotunda vel cordata; petioli inferiores longi, villosi. *Flores* laxe paniculati, paniculae ramis 2-fasciculatis, bractea magna pilosa et ciliata 6–12 mm. longa, ad ramorum originem instructi, uno ramo 2–3 flores sessiles apice gerente, altero ramo similiter diviso; bracteolae ovtao-lanceolatae, subacutae, membranaceae, nervo medio obscure brunneo conspicuo. *Perianthium* alabastro 3 mm. longum, parte inferiore 1 mm. longa, subglobosa, demum elongata. *Fructus* 3 mm. longus, oblongus, costatus, glandulosus.

South Africa. Avoca near Barberton, 570 m., *Galpin*, 1240; Bechuanaland, on the rocks at Chue Vley, *Burchell*, 2381; Port Natal, *Gerrard*, 1787.

There is also a small specimen in Harvey's Herbarium, Trinity College, Dublin, from Damaraland (Tropical Africa) without collector's name.

1069. **Cyrtanthus (Gastronema) Thorncroftii**, *C. H. Wright* [Amaryllidaceae-Amarylleae]; *C. unifloro*, Ker-Gawl., affinis, perianthio unicolore staminibusque non oblique insertis differt.

Bulbus subglobosus, 2 cm. diametro, in collum 3 cm. longum 7 mm. crassum productus, tunicis membranaceis brunneis vestitus. *Folia* duo, anguste oblanceolata, 15 cm. longa, 5 mm. lata, longe acuminata, parte superiore supra leviter sulcata, subtus carinata, parte inferiore plano-convexa, superficie superiore quam inferiore pallidiore. *Scapus* leviter compressus, 3 mm. diametro, viridis, 2-florus ; spathae submembranaceae, 3·5 cm. longae, basi 6 mm. latae, gradatim attenuatae ; pedicelli 2 cm. longi. *Perianthium* dilute carneum, non striatum ; tubus anguste infundibuliformis, 5 mm. longus, 2 mm. diametro ; limbus campanulatus, 2·5 cm. diametro ; lobi oblongo-lanceolati, exteriores apice callosi cucullatique, interiores plani acutioresque. *Stamina* in perianthii fauce inserta ; filamenta exteriora 2 mm. longa, interiora 4 mm. longa. *Ovarium* oblongum, trigonum, 5 mm. longum, 2·5 mm. diametro ; stylus 3 cm. longus, ramis linearibus recurvis 4 mm. longis instructus.

Transvaal. *Thorncroft.*

Described from a plant which flowered with Mr. W. E. Gumbleton at Belgrove, Queenstown, Ireland, in July, 1908.

1070. **Elionurus tenax,** *Stapf* [Gramineae - Andropogoneae] : affinis *E. Pobeguinii*, Stapf, sed racemis ob pedunculos breves lateraliter e spatha exsertis, rhachis tenuioris tenacis articulis uti pedicellis dorso toto villosis, spiculis sessilibus paulo minoribus brevius bifidis. gluma inferiore dorso villosa distinctus.

Culmi ultra pedales, e partibus superioribus tantum noti, ramosi ; internodia superiora et rami superne pilosi. *Folia* superiora glabra : vaginae laeves ; ligulae ad marginem breviter dense ciliatam redactae ; lamina e basi 2–3 mm. lata longe tenuissime attenuata, convoluta, superne ad costam et margines spinuloso - asperae. *Racemi* in ramis geminati, distantes, pedunculo brevi insidentes, e spatha 5–6 cm. longa lineari acuta superne late hyalina lateraliter exserti, densiflori, pilosi, albidi. *Rhacheos* tenacis articuli graciles, spicula duplo breviores, praeter faciem ubique albo-villosi. *Spiculae* sessiles cum callo brevi piloso 6 mm. longae, ovato-lanceolatae. *Gluma* inferior subchartacea, ad $\frac{1}{6}$–$\frac{1}{5}$ bifida, laciniis subulatis perinde ac carinis a basi rigide pectinato-ciliatis, dorso albopilosa, intra carinas tenuiter 5-nervis ; superior lanceolata, acuta, tenuiter 3-nervis, dorso minute pubescens. *Anthoecii* inferioris valva lanceolata, margine ciliolata, 3·5 mm. longa, obsolete 2-nervis, palea nulla. *Anthoecii* superioris valva paulo brevior, minute ciliolata, obsolete 3-nervis, caeterum valvae inferiori similis ; palea hyalina, minuta, 0·5 mm. longa. *Antherae* purpureae, 2 mm. longae. *Pedicelli* articulos subaequantes, graciles, dorso undique villosi. *Spiculae* pedicellatae 3·5–4 mm. longae, lanceolatae. *Gluma* inferior lanceolata, mucronato-acuminata, integra, sub altero margine anguste inflexo breviter ciliato stria balsamifera notata, altero angustissime inflexo vix ciliolato, dorso parce breviterque pubescens; reliqua fere ut in spiculis sessilibus, nisi flos masculus.

French Guinea. Kankan, *Bardou*, 15, 36.

LXI.—MALAYAN FERNS.

Col. R. H. Beddome.

The following notes on Ferns collected in the Malay Peninsula, from time to time, by Mr. H. N. Ridley, F.R.S., Director of the Botanic Gardens, Singapore, and transmitted by him to Kew, have been drawn up by Col. R. H. Beddome, F.L.S.; a description of one new species is included.

Alsophila glauca, *J. Sm.* (Ridley, 7868). This is less glaucous than the typical form, and the rhachis of the frond, as well as the stipe, is strongly armed with red prickles.

Alsophila dubia, *Bedd.* (Ridley, 7869 and 12534). More copious specimens of this tree fern prove that it is not specifically distinct from *A. commutata*, Mett., which is very variable and includes narrow and broad pinnuled forms with intermediate ones.

Alsophila ornata, *J. Scott* (Ridley, 6551 and 7151). These exactly correspond to the Indian examples of *A. ornata*. Mr. Ridley has sent a very large series of specimens of *A. latebrosa*, Wall., from various parts of the Malay Peninsula, which represent different stages between the type (which has the lobes of the pinnules only 1 cm. long and scarcely or very inconspicuously crenate), and *A. crenata*, J. Scott (which has the lobes 2·2 cm. long and conspicuously crenate). *A. ornata* must therefore be dropped as a species, but may be kept up as an extreme form under the name of **A. latebrosa, var. ornata**, Bedd.

Cibotium glaucum, *Hook. et Arn.* (Ridley, 9532). This has not been recorded previously from the Malay Peninsula, but exactly corresponds with Sandwich Island specimens. It differs from *C. Barometz*, J. Sm., in its involucre and venation.

Microlepia Speluncae, var. hirta, *Bedd.* (Ridley, 7138). A form from Pulau Penang with the pinnules more deeply cut than usual.

Hypolepis punctata, *Bedd.* (Ridley, 7867). Suppl. Ferns Brit. Ind. p. 19. Ridley's specimens have a prominent involucre.

Pteris quadriaurita, var. hamulosa, *Bedd.* (*P. hamulosa*, Wall.) (Ridley, 6946). Collected in Johor.

Asplenium tenuifolium, *Don* (Ridley, 14001). Collected at Padang and with fronds much less cut than in the Indian forms.

Diplazium tomentosum, *Bl.* (Ridley, 11428). Collected in Perak. The pinnules are much more deeply cut than in the type: there are, however, intermediate forms in the Kew Herbarium.

Lastrea Ridleyi, *Bedd.*; species *Nephrodio* (*Lastreae*) *Thelypteri*, var. *squamuloso*. Hook., affinis, rhizomate erecto pinnisque angustis recedit.

Rhizoma erectum. *Stipites* caespitosi, rigidi, erecti, obscure rufo-brunnei, 9 cm. longi, puberuli, squamis lanceolatis longe acuminatis (praesertim basi) instructi. *Frondes* circa 15 cm. longae et 5 cm. latae, anguste oblongae, parte inferiore pinnata, apice pinnatifida, siccitate fere atrae; pinnae 18–20-jugae, alternae vel inferiores

suboppositae, coriaceae, 2 cm. longae, 8 mm. latae, fere ad rhachidem in lobos oblongos obtusos leviter crenatos minute ciliatos divisae, loborum paria 3–4 infima deflexa mediis minora ; venae semper indivisae. *Sori* 1–3 ad quosque lobos, ad mediam venarum affixi ; indusium non visum.

Malay Peninsula. Selangor : Bukit Hetam, *H. N. Ridley*, 7849.

The sori are over ripe and show no trace of an indusium, which if constantly absent would cause this plant to be placed in *Phegopteris.*

Lastrea cana, *J. Sm.* (Ridley, 7859). Collected at Selangor.

Nephrodium moulmeinense, *Bedd.* (Ridley, 10972). Collected in Johor.

Nephrodium molle, *R. Br.* (Ridley, 6963.) A form with very narrow pinnules collected at Parmatang Bartan, similar to No. 3212 of a former collection from Gunong.

Nephrodium molle, var. **major,** *Bedd.* (*N. Papilio,* Hope) (Ridley, 7853). There are many forms intermediate between this and the type.

Polypodium subevenosum, *Baker* (Ridley, 7134 and 10172). Collected in Pulau Penang.

Polypodium minimum, *Baker* (Ridley, 12136). Collected in Johor, only recorded previously from Borneo.

Polypodium subpinnatifidum, *Bl.* (Ridley, 12035). Collected in Pulau Penang.

Goniophlebium amoenum, *J. Sm.* (Ridley, 12033). A form collected in Selangor differing from those hitherto known only in its smaller size.

LXII.—MISCELLANEOUS NOTES.

Mr. T. F. Chipp, who entered the service of Kew as a young gardener on April 2nd, 1906, and thereafter was employed, from September 17th, 1906, to October 10th, 1908, as a temporary Technical Assistant in the Herbarium, has successfully passed the B.Sc. examination in the University of London, with honours in Botany. We understand that he has been appointed Demonstrator in Botany at the Birkbeck Institute.

Dr. Maurits Greshoff.—With much regret we have to record the sudden death of Dr. M. Greshoff, Director of the Koloniaal Museum, Haarlem, during the night of December 7–8. Dr. Greshoff was the son of a medical practitioner, and studied at the University of Utrecht and afterwards at Jena. On taking his degree he entered the medical service of the Dutch East Indian Army and was sent to the Botanic Gardens, Buitenzorg, where from 1888–1892 he carried on an investigation of Indian poisonous plants. His results were published in two volumes in "Mededeelingen uit 's Lands Plantentuin." Owing to a breakdown in health, in 1892, he returned to Holland, and a few years later was

appointed Chemist to the Koloniaal Museum, Haarlem, and, on the death of the Director, he succeeded to that office and continued his work on Indian products.

When at Buitenzorg he became associated with Dr. M. Treub, late Director of the Botanic Gardens, in the study of hydrocyanic acid in *Pangium edule*, and afterwards paid much attention to cyanogenesis in plants, and also to the presence of alkaloids, holding the view that the presence of these substances could be utilised as characters in the classification of plants.

Dr. Greshoff worked at Kew in 1898 and paid a short visit in September, 1908. During the past summer he spent about three weeks here working in the Jodrell Laboratory.

On the occasion of his last visit he was, as always, an indefatigable worker, and examined material from every department of the Gardens in the prosecution of his researches. The paper in this number of the *Bulletin* which embodies some of the results of his work at Kew was meant to be the first part of a general systematic survey of those plants which contain hydrocyanic acid, alkaloids, &c. The proofs of the paper reached us on the same day as the sad news of his death at the early age of 47.

Sir Alfred Jones, K.C.M.G.—The death of Sir Alfred Jones, on 13 December, 1909, at the comparatively early age of 62, has deprived Kew of a friend who took a deep and helpful interest in the economic work of the institution and in its policy of establishing Botanic Stations in the West African Colonies. His successful efforts in developing the trade and in creating a market for tropical fruits—more especially bananas—in this country are now a matter of history. More recently his energies were directed to fostering the cultivation of cotton within British possessions. Among his other attempts to ensure the application of scientific knowledge to affairs may be mentioned his support of preventive medical measures undertaken in order to improve the amenities of life under tropical conditions.

Quinoa or Quinua (*Chenopodium Quinoa*).—From time to time samples of the seeds of this plant have been received at Kew for determination, and a short time ago a series of specimens collected by the Assistant Director on the shores of Lake Titicaca, Bolivia, at an elevation of 3800–4000 m., were added to the Museum Collection. In Monthly Consular and Trade Reports, No. 344 (U.S.A.), for May 1909, it is stated that "Americans are seeking information with regard to the 'quinua' grain of the Andes Mountains with the view to its possible importation into the United States. The plant grows at a high altitude and supplies cereal food in regions where other grain and potatoes will not thrive. Consul-General Herman R. Dietrich, of Guayaquil, furnishes the following information concerning its growth and use in Ecuador:—In this country quinua is cultivated to some extent in the valleys of the Andes, where the climate is cool, and at an elevation of 6,000 to 9,000 feet. There are two classes, called 'yellow quinua,' and 'white

quinua,' which are marketed at the same price. In the Yaruqui Valley, near Quito, it appears to be most abundant, and it is reported that 100 tons may be obtained there yearly. It is said that about 20,000 pounds of this article may be bought in Quito monthly, and that by offering a small advance in price, a much larger quantity could be obtained in the provinces of Pichincha and Imbabura, which are situated in the inter-Andean Valleys.

"It is seldom that there is a failure of the quinua crop. This only occurs once in a number of years, when there is great scarcity of rain. The quinua when harvested and dried, and then stored in a perfectly dry place, will keep for about one year, after which it will lose more or less of its flavour. During the time it is kept in this dry state it retains its bitter qualities, for which reason it is not subject to the attack of insects as it would otherwise be. It is stated that the Indians hang the plant outside of their houses in the same manner as they do tobacco and bananas, but rarely keep it in this state longer than three months, although if kept thoroughly dry it can be kept as long as six months.

"The quinua is washed before cooking, which may be done by machinery, for the reason that the washing takes away a portion of the bitter element which it contains."

As an article of food quinoa is principally used by the Indians or the labouring classes, who earn very small wages. By these it is cooked in an open pot and frequently in sufficient quantity to last the family for some time. In its cooked state it is again allowed to dry, and it is then an easy matter to preserve it for some weeks. The dishes prepared from it are soups; cakes with brown sugar added to them, called "panela"; and a drink called "chicha de quinua," made from a mixture of quinoa and corn or barley.

Teodoro Wolf states in his Geography and Geology of Ecuador, which was published in 1892, that corn and quinoa were the principal articles of food of the ancient Indians, and that the raising of the latter was more extensively engaged in by them than by the present inhabitants, on account of the recent introduction and development of other cereals.

"The price usually paid for quinua in this country is from $3 to $5 United States currency per quintal of 46 kilos (101 pounds). The bulk of this article is marketed from June to October. As to the cost of shipping this product to San Francisco or New York, it may be stated that the freight rate from Quito to Panama is about $3 United States currency per quintal, with an additional expense of about 50 cents per quintal for packing."

Quoting from Prof. A. H. Church in "Food Grains of India," the plant was introduced some years ago into that country from Peru, but so far as can be gathered its introduction does not appear to have been a success.

According to this writer a light argillaceous soil or loam is suitable for the growth of the plant. It may be sown in furrows or on ridges a yard apart, the plants in the rows being singled so as to leave two feet between each; but it yields heavier heads of grain when sown in nurseries and then transplanted to the fields. The harvest takes place seven months after seed-time. It is a hardy plant, which may be grown successfully in countries and climates

and at elevations above the sea such as are suited to the barley crop.

The following analysis was made, by the late Dr. A. Voelcker, of the bitter variety of quinoa seed, which variety appears to differ from the ordinary sort only in the presence of a small quantity of a bitter and acrid substance :—

	In 100 parts.	In 1 lb.
Water	16·0	2 ozs. 245 grs.
Albuminoids ...	19·2	3 „ 32 „
Starch, &c. ...	47·8	7 „ 283 „
Oil	4·8	0 „ 336 „
Fibre	8·0	1 „ 122 „
Ash	4·2	0 „ 294 „

Quinoa seeds should be soaked for a short time in water and boiled quickly therein; this water should then be thoroughly drained away on a sieve or colander, and the cooking finally completed in another portion of fresh water. Under this treatment the bitter principle present in one of the chief varieties of this seed is removed.

Quinoa seeds are extremely small; 15,000 do not weigh more than an ounce.

J. M. H.

Longevity of Fern-spores.—An illustration of this has occurred in the case of *Cheilanthes mysurensis*, Wall., specimens of which were collected in South China on the 28th of October, 1899, and preserved as herbarium specimens. Spores taken from these and sown at Kew in March, 1908, have produced healthy plants, which now bear fully developed fronds about 9 inches long. The species grows in dry rocky places at low elevations, and is distributed from Japan, Formosa and Central China to Tonkin, Southern India and Ceylon. When the fronds are dried without much pressure, their margins incurve greatly and serve as an additional protection to the spores.

C. H. W.

The Useful Plants of Nigeria.—Under this title an account of Nigerian plants of economic importance is being prepared by Mr. J. H. Holland, Assistant in the Museums, Royal Botanic Gardens, Kew. The first instalment of this work has recently been published as *Kew Bulletin ; Additional Series IX., Part I.* This part contains 176 pages, with an outline map of Nigeria and plans of the Botanic Station, Olokemeji, of the Botanic Gardens, Old Calabar, and of the Onitsha Plantations, Southern Nigeria. There is also a chart shewing the exportation of mahogany for the period of years 1894–1907. The introductory portion occupies the first 47 pages of this part, and gives a short account of Southern and Northern Nigeria, followed by some general remarks on the botany of the region, with notes as to the collection of specimens; a list of botanical collectors and a historical account of the various botanic stations. The progress of agriculture and forestry are also reviewed.

The useful plants of the various natural orders are then dealt with seriatim, and in every case references to the most important illustrations of the various plants mentioned are given, and the literature is cited under each species. Where possible the vernacular names of the plants are added. The arrangement of the systematic portion follows that of the *Flora of Tropical Africa*.

In this first instalment the orders *Ranunculaceae* to *Anacardiaceae* are dealt with, and the account of *Anacardium occidentale* completes the part.

In addition to the general information on the economic importance of the various species dealt with, notes are given as to methods of cultivation and propagation.

A preface and an index to the work will be issued with the concluding part.

Botanical Magazine for December.—*Parthenocissus tricuspidata*, Planch., is the favourite climber better known as *Ampelopsis Veitchii*, Hort., or *Vitis inconstans*, Miq., which, in consequence of an article in one of the daily papers, has been frequently confused with the Poison Ivy, *Rhus Toxicodendron*. The *Parthenocissus* is a harmless plant, usually having simple leaves, whereas in the Poison Ivy the leaves are never simple. A native of Japan and China, it was brought into general cultivation in 1868 by Messrs. J. Veitch & Sons. The South African *Asparagus tetragonus*, Bresler, has been grown at Kew for many years past. It is a climbing under-shrub with linear cladodes and rather dense racemes of white, very fragrant flowers. *Prunus maritima*, Wangenh., is the Shore Plum of Eastern North America. It is a low-growing shrub with white flowers and red-purple, usually ellipsoid, fruits nearly 1 in. long. It flowers in May at Kew, where it has long been in cultivation. *Opuntia imbricata*, DC., is a native of Mexico and the South-Western United States, and has been figured from a specimen collected in Colorado in 1878 by Sir E. G. Loder, Bart., in whose garden at Leonardslee, Horsham, it flowered in August, 1908. It belongs to a small group of Opuntias which have cylindric stems with short ridge-like compressed tubercles and closely sheath-clad spines. Though first introduced to cultivation about a century ago, and the best known of its group in European gardens, its bright purple flowers are rarely seen in this country. *Euryops virgineus*, Less., is a small South African shrub belonging to the Compositae. It has very small 3–5-lobed leaves and solitary, axillary, rather small flower-heads on peduncles about 1 in. long. The figure was prepared from material sent to Kew by Mr. T. A. Dorrien Smith, of Tresco Abbey, Isles of Scilly.

The present volume of the Magazine (vol. 135) is dedicated to Mr. F. W. Moore, M.A., A.L.S., V.M.H., Keeper of the Royal Botanic Garden, Glasnevin, Dublin.

INDEX.

A.

Abelia, saponin, 402.
Acacia kwebensis, *N. E. Br.*, 108.
— Lugardae, *N. E. Br.*, 107.
— rufobrunnea, *N. E. Br.*, 107.
—, saponin, 402.
Achyranthes, saponin, 402.
Acridocarpus alopecurus, *Sprague*, 185.
Acriopsis latifolia, *Rolfe*, 368.
Adenium Lugardi, *N. E. Br.*, 119.
Agave Wrightii, 319.
'Agriculture in the Tropics,' 395.
Albizzia Lugardi, *N. E. Br.*, 109.
Alectryon, hydrocyanic acid, 402.
Alkaloids, 402.
Aloe rubrolutea, 318.
Alpinia bracteata, 74.
Alsophila dubia, 423.
— glauca, 423.
— ornata, 423.
Amarantus, saponin, 402.
Ampelopsis Veitchii, 428.
Anacyclus, hydrocyanic acid, 402.
Andrachne, hydrocyanic acid, 402.
Androstachys Johnsonii (with figs.), 201.
Angadenia nitida, 30.
Angola, oil palm in, 43.
Anisacantha muricata, 32.
Annesley, Earl, 72.
Anopyxis ealaënsis, 309.
Anthemis, hydrocyanic acid, 403.
Anthericum laxum, *N. E. Br.*, 143.
Anthurium trinerve, 227.
Aphanocladia delicatula, 243.
Aphanopetalum, alkaloids, 403.
Aphelandra tetragona, 348.
Appointments :—
  Benton, A. W., 224.
  Boodle, L. A., 150.
  Brown, N. E., 150.
  Campbell, J. W., 342.
  Carruthers, J. B., 150.
  Clark, Miss J. J., 390.
  Coutts, J., 193.
  Craib, W. G., 225.
  Cummins, Major H. A., 391.
  Dallimore, W., 150.
  Gallagher, W. J., 342.
  Gill, R., 315.
  Haas, Dr. P., 150.
  Hardie, A., 68.
  Hutchinson, J., 225.
  Miles, A. C., 22.
  Stapf, Dr. O., 24.
  Stockdale, F. A., 150.
  Worsdell, W. C., 22.
  Wright, C. H., 24, 150.
Araliaceae containing saponin, 411.
Arbutus Menziesii, 227.
Aristolochia Kirkii, *Baker*, 213.
— rigida, var. major, *C. H. Wright* 213.
Arrhenatherum, saponin, 403.
Artemisia vulgaris, 159.
Arundinaria tessellata, 59.
Asclepias stellifera, 345.
'Aspects de la Végétation en Belgique,' 320.
Asparagus tetragonus, 428.
Asplenium tenuifolium, 423.
Astragalus, saponin, 403.
Atriplex, saponin, 404.
— semibaccata, 31.
Australian pasture herbs, 12.
— saltbushes, 30.

B.

Baikiaea insignis, 342.
Bamboo ropes, Chinese, 316.
—, South African, 59.
'Banks, Sir Joseph, the Father of Australia,' 351.
Barbados, experiments with Sugar-canes, 77.
Barleria cristata, 158.
— lupulina, 343.
— Prionitis, 156, 343.
— spathulata, *N. E. Br.*, 128.
Beddome, Col. R. H., Malayan Ferns, 423.
Begonia modica, 279.
Belgium, vegetation of the coast region, 319.
Bengal, Lower, process of cleaning rice in, 229.
Benton, A. W., 224.
Berberis approximata, *Sprague*, 256.
Billardiera longifolia, saponin, 415.
Boerhaavia bracteata, *T. Cooke*, 421.
— diffusa, 13.
Boletus albellus, *Massee*, 206.
— altissimus, *Massee*, 205.
— Alwisii, *Massee*, 205.
— bicolor, *Massee*, 205.
— flavipes, *Massee*, 208.
— flexipes, *Massee*, 208.
— funerarius, *Massee*, 207.
— longipes, *Massee*, 207.
— nanus, *Massee*, 208.
— pachycephalus, *Massee*, 206.
— parvulus, *Massee*, 208.
— Ridleyi, *Massee*, 207.
— rufo-aureus, *Massee*, 204.
— tristiculus, *Massee*, 206.
— umbilicatus, *Massee*, 205.
— unicolor, *Massee*, 207.

Bombax brevicuspe, *Sprague*, 306.
Bombay, Flora of, 229.
Bombonasa and Pastasa rivers, vegetation of, 216.
Boodle, L. A., 150.
Books :—
Agriculture in the Tropics, 395.
Aspects de la Végétation en Belgique, 320.
Botanical Magazine, 30, 74, 150, 227, 279, 318, 348, 394, 395, 428.
Cyperaceae, illustrations of, 280.
Flora Capensis, 150.
— of Bombay, 229.
Materials for Flora of Malayan Peninsula, 159.
Para rubber, cultivation and preparation of, 320.
Sir Joseph Banks, the Father of Australia, 351.
The useful plants of Nigeria, 427.
West Indian Reports, 77.
Botanical Magazine, 30, 74, 150, 227, 279, 318, 348, 394, 395, 428.
Brown, N. E., 150.
Brownlowia Havilandii, *Stapf*, 257.
B'tinga rubber, 321.
Buddleia, saponin, 404.
Bulbophyllum (Cirrhopetalum) campanulatum, *Rolfe*, 62, 395.
— nudiscapum, *Rolfe*, 365.
Bussea xylocarpa, *Sprague et Craib*, 351.

C.

Cacao, witches' broom of, 223.
Calandrinia balonensis, 16.
Calliandra xylocarpa, 351.
Callicoma, saponin, 404.
Callitris sinensis, 393.
Callophyllis Hombroniana, 240.
Calophyllum, saponin, 404.
Cameroons, oil palm in, 44.
Campbell, J. W., 342.
Canadian wild rice (with plate), 381.
Canella, hydrocyanic acid, 404.
Cape Flora, 151.
Caraipa africana, 226.
Caralluma Nebrownii, 318.
— sacculata, *N. E. Brown*, 328.
Carrieria calycina, 353.
Carrot, Australian native, 14.
Carruthers, J. B., 150.
Cassia, saponin, 404.
Castanospermum, saponin, 405.
Catalpa bignonioides, 55.
Ceanothus, saponin, 405.
Cephalonema, *K. Schum.*, 325.
— polyandrum, *K. Schum.*, 325.
Cephalotaxus drupacea, 395.
Cercis, saponin and tannin, 405.
Cercocarpus, hydrocyanic acid, 405.
Cereus amecamensis, 394.
Ceropegia Brownii, *Ledger*, 326.
— dentata, *N. E. Brown*, 327.
— discreta, *N. E. Brown*, 262.
— hastata, *N. E. Brown*, 327.
Cheilanthes mysurensis, 427.
Chenopodium atriplicinum, 31.
— auricomum, 31.
— nitrariacea, 31.
— Quinoa, 425.
Chinese bamboo ropes, 316.
Chipp, T. F., 424.
Chironia (Plocandra) uniflora, *A. W. Hill*, 307.
Chloropatane Batesii, *C. H. Wright*, 214.
Choisya, alkaloids, 405.
Chrysosplenium, saponin, 405.
Chrysymenia asperata, 241.
Cibotium glaucum, 423.
Cinnamomum, camphor, 405.
Cissus adenopodus, 394.
Claoxylon virens, *N. E. Br.*, 140.
Clare Island, marine algae, 312.
Clark, Miss J. J., 390.
Cleistanthus Johnsonii, *Hutchinson*, 380.
— — var. pubescens, *Hutchinson*, 380.
Clematis, hydrocyanic acid and saponin, 406.
Clerodendron ugandense, 30.
Clover, Darling, 12.
Cobaea, saponin, 406.
Coelocaryon oxycarpum, *Stapf*, 188.
Coelogyne venusta, 318.
Coffee diseases of the New World, 337.
Colletotrichum luxificum, 223.
Combretum kwebense, *N. E. Br.*, 111.
—, saponin, 406.
— Stocksii, *Sprague*, 306.
Commelina nudiflora, 80.
Commiphora kwebensis, *N. E. Br.*, 98.
— Lugardae, *N. E. Br.*, 99.
Compositae containing hydrocyanic acid, 408.
Cormus, hydrocyanic acid, 406.
Cornus Bretschneideri, 334.
— chinensis, 335.
— controversa, *Hemsl.*, 279, 331.
— Fordii, *Hemsl.*, 334.
— Hemsleyi, 334.
— macrophylla, 279, 329.
— Mombeigii, *Hemsl.*, 333.
— oblonga, 334.
— paucinervis, 334.
— poliophylla, 333.
— Stracheyi, *Hemsl.*, 333.
— Wilsoniana, 334.
Cortaderia, hydrocyanic acid, 406.
Cortusa, saponin, 407.
Cotoneaster moupinensis floribunda, 395.
Coutts, J., 193.
Craib, W. G., 225.

Crassula elata, *N. E. Br.*, 110.
Crinum crassicaule, *Baker*, 142.
Crotalaria incompta, *N. E. Br.*, 101.
Croton kwebensis, *N. E. Br.*, 140.
Crowfoot, 13.
Cucumber and tomato canker (with plate), 292.
Cucumis, saponin, 407.
Cummins, Major H. A., 391.
Cupania, hydrocyanic acid, 402.
Cycas Micholitzii 150.
Cycnoches chlorochilon, seeds of, 200.
— densiflorum, *Rolfe*, 63, 319.
—, revision of the genus (with plate), 268.
'Cyperaceae, illustrations of,' 280.
Cyrtanthus (Gastronema) Thorncroftii, *C. H. Wright*, 421.
Cystopteris, hydrocyanic acid, 407.

D.

Dahomey, oil palm in, 41.
Dallimore, W., 150.
Darling Clover, 12.
Darwin, bust of, in Kew Museum, 315.
Daucus brachiatus, 14.
Davallia, hydrocyanic acid, 407.
Decades Kewenses, 256, 357.
Dendrobium Bronckartii, 227.
Deutzia, saponin, 408.
— setchuenensis, 228.
Devonshire, trees noted in, 334.
Deyeuxia, saponin, 408.
Diagnoses Africanae, 49, 184, 212, 305, 325, 376, 419.
Dichrostachys arborea, *N. E. Br.*, 106.
— Lugardae, *N. E. Br.*, 106.
Dicraea Garrettii, *C. H. Wright*, 213.
— tenax, *C. H. Wright*, 213.
Dictyota ocellata, 239.
Diervilla, saponin, 408.
Dimorphotheca, hydrocyanic acid and saponin, 408.
Dionaea, saponin, 408.
Diplazium tomentosum, 423.
Dipteronia sinensis, 354.
Dirca, saponin, 409.
Discaria, saponin, 409.
Diseases of Plants :—
Cacao, witches' broom of, 223.
Coffee diseases of the New World (with figs.) 337.
Colletotrichum luxificum, 223.
Cucumber canker (with plate), 292.
Dry scab of potatoes (with figs.) 16.
Eelworm in fern fronds (with figs.), 243.
Funtumia disease, 147.
Mancha coffee disease, 337.
Mycosphaerella citrullina (with plate), 292.
Nectria funtumiae, 147.
Diseases of Plants—*cont.*
Potatoes, dry scab of (with figs.), 16.
Sphaerostilbe flavida (with figs.), 337.
Spondylocladium atrovirens (with figs.), 16.
Tap-root disease of coffee, 341.
Tomato canker (with plate), 292.
Viruela coffee disease, 337.
Witches' broom of Cacao, 223.
Drimys, hydrocyanic acid and tannin, 409.
Drosera, hydrocyanic acid, 409.
Dry scab of potatoes (with figs.), 16.

E.

Ecanda rubber (with plate and figs.), 321.
Ecbolium cognatum, *N. E. Br.*, 130.
— Lugardae, N. E. Br., 130.
Eelworm in fern fronds (with figs.), 243.
Elaeis guineensis (with figs.), 33, 161.
Elionurus tenax, *Stapf*, 422.
Encephalartos Barteri 30.
Ennealophus, *N. E. Brown*, gen. nov., 361.
— amazonicus, *N. E. Brown*, 361.
Epacris dubia, 228.
— — var. subrefiexa, 228.
Eranthemum Wattii, 74.
Eria ochracea, *Rolfe*, 366.
— rhynchostyloides, 30.
— (Eriura) solomonensis, *Rolfe*, 63.
Erlangea tomentosa, 319.
Erodium cygnorum, 13.
Erythrina ovalifolia, 198.
Erythronium, saponin, 409.
Euphorbia elastica, 392.
— fulva, 392.
— kwebensis, *N. E. Br.*, 137.
— Ledienii, 349.
Eurotia, saponin, 410.
Euryops virgineus, 428.
Exacum, saponin, 410.
Exochaenium exiguum, *A. W. Hill*, 50.
Exostemma subcordatum, 349.
Eysenhardtia amorphoides, 293.

F.

Faurea decipiens, *C. H. Wright*, 328.
Fern spores, longevity of, 427.
Ferns, Malayan, 423.
Ficus Sycomorus, 74.
Flora Capensis, 151.
— of Bombay, 229.
— — Ngamiland (with map), 81.
Fockea capensis, 349.
Forsythia, saponin, 410.
Fritsch, Dr. F. E., 150.

Frost cracks, 54.
Frosts, spring, 54.
Fungi Exotici, 204.
Funtumia disease, 147.

G.

Galactia Lugardi, *N. E. Br.*, 104.
Galega, saponin, 410.
Gallagher, W. J., 342.
Gambia, oil palm in, 41.
Gentiana Freyniana, 343.
Geranium dissectum, 13.
Gilia, saponin, 410.
Gill, R., 315.
Ginger, green, 158.
Gladiolus subaphyllus, *N. E. Br.*, 53.
Gleichenia, saponin, 410.
Glossochilus parvifiorus, *Hutchinson*, 186.
Gold Coast, oil palm in, 38.
Goniophlebium amoenum, 424.
Grass, Lalang, 55.
— Toowoomba Canary, 289.
Green ginger, 158.
Greshoff, Dr. M., 424.
—, — —, phytochemical investigations at Kew, 397.
Grewia calycina, *N. E. Br.*, 97.
— cordata, *N. E. Br.*, 96.
— Drummondiana, *Sprague*, 21.
— grisea, *N. E. Br.*, 94.
— kwebensis, *N. E. Br.*, 95.
— oligoneura, *Sprague*, 22.
— salamensis, *Sprague*, 67.
— — var. rotundata, *Sprague*, 68.
—, section Microcos, in Africa, 66.
—, — Omphacarpus, in Africa, 18.
— subspathulata, *N. E. Br.*, 95.

H.

Haas, Dr. P., 150.
Hail, injuries to plants by (with plate), 53.
Halimodendron, saponin, 410.
Hardie, A., 68.
Hemsley, W. B., retirement of, 22.
Heptapleurum, saponin, 410.
Herbarium Savatier, 148.
Heritiera utilis, 348.
Hermannia Lugardi, *N. E. Br.*, 94.
Hippocratea parviflora, *N.E. Br.*, 99.
Hogweed, 13.
Hooker, Sir J. D., Indo-Chinese and Malayan Impatiens, 1.
—, — — —, Philippine Impatiens, 281.
Hutchinson, J., 225.
Hydrangea, hydrocyanic acid, 411.
Hydrocotyle Versteegii, *Hemsl.*, 259.
Hydrocyanic acid, 400.
Hypolepis punctata, 423.

I.

'Illustrations of Cyperaceae,' 280.
Impatiens cryptoneura, *Hk. f.*, 9.
— Curtisii, *Hk. f.*, 6.
— diffusa, *Hk. f.*, 7.
— Hawkeri, 227.
—, Indo-Chinese and Malayan, 1.
— macrosepala, *Hk. f.*, 10.
— manillensis, 289.
— Musyana, *Hk. f.*, 8.
— oncidioides, *Ridley*, 11.
—, Philippine species of, 281.
— pygmaea, *Hk. f.*, 8.
— Ridleyi, *Hk. f.*, 9.
— Scortechinii, *Hk. f.*, 11.
— Wrayi, *Hk. f.*, 6.
Imperata arundinacea, 55.
Incarvillea grandiflora, var. brevipes, *Sprague*, 263.
Indigofera dentata, *N. E. Br.*, 102.
— stenophylla, var. ampla, *Sprague*, 185.
— variabilis, *N. E. Br.*, 103.
Indo-China, some species of Impatiens, from, 1.
Injuries to plants by hail and storm (with plate), 53.
Ipomoea kentrocaulos, var. pinnatifida, *N. E. Br.*, 124.
— kwebensis, *N. E. Br.*, 123.
— verecunda, *N. E. Br.*, 123.
Ireland, marine algae, 312.
Isopyrum, hydrocyanic acid, 411.

J.

Jaborandi, Guadeloupe, 76.
Jamesia, hydrocyanic acid, 411.
Jasminum Wyliei, *N. E. Brown*, 419.
Jatropha humilis, *N. E. Br.*, 139.
Jodrell laboratory, research in, 28, 397.
Jones, Sir A., 425.
Justicia Gendarussa, 156, 343.

K.

Kageneckia, hydrocyanic acid, 411.
Kalahari desert, 83.
Kew arboretum, stone seat in, 160.
—, Assistant for Tropical Africa, 225.
—, — Keepers, 150.
—, Berberis Dell, 73.
—, effect of the winter on trees and shrubs, 233.
— fungi, new and additional species, 373.
— Herbarium, additions to, 26.
— —, Keeper, appointment of, 24.
— — —, retirement of, 22.
— Jodrell Laboratory, research in, 28, 397.

Kew Museums, 25.
— —, Bust of Darwin in, 315.
— —, presentations to, 197, 315, 316, 317, 346, 425.
—, pathological research at, 29.
—, phytochemical investigations at, 397.
— Rubi, 369.
—, visitors in 1908, 24.
— walks, alteration of, 73.
—, Wild Fauna and Flora, additions to (with plate), 243, 369.
Killerton Park, trees at, 337.
King, Sir George, 68.
—, — —, list of works by, 193.
Kitchingia uniflora, 395.
Knightia, saponin and tannin, 412.
Kochia aphylla, 31.
— pyramidata, 32.
—, saponin, 412.
Kokoti, 309.
Kolkwitzia amabilis, 354.

L.

Lake Ngami, 82.
Lalang grass, 55.
Larix Griffithii, 335.
— occidentalis, 227.
Laseola lugens, *Cambr.*, 249.
Lastrea cana, 424.
— Ridleyi, *Bedd.*, 423.
Lathys (Lethia) lepida, *Cambr.*, 248.
Laurelia serrata, 394.
Leathesia difformis, 239.
Leonotis kwebensis, *N. E. Br.*, 132.
Lignum nephriticum, 293.
— Vitae, a substitute for, 156.
Limeum kwebense, *N. E. Br.*, 114.
Liriodendron, hydrocyanic acid and saponin, 412.
Longevity of fern spores, 427.
Lonicera Giraldii, 30.
—, saponin, 412.
Loranthus Lugardi, *N. E. Br.*, 135.
— splendens, *N. E. Br.*, 136.
Lucerne, Australian, native, 15.
Lucuma, hydrocyanic acid, 412.
Lugard, Major E. J., Flora of Ngami-land, 81.
Lycium leptacanthum, *C. H. Wright*, 308.

M

Macadamia, hydrocyanic acid, 413.
Mackinlaya amplifolia, *Hemsl.*, 260.
— confusa, *Hemsl.*, 259.
Magnolia Delavayi, 395.
Mahonia arguta, 318.
Makruss (with figs.), 201.
Malay Peninsula, botanical journey in, 159.
Malay Peninsula Ferns, 423.
— — Impatiens, 1.
— —, Materials for a Flora of, 159.
Mancha coffee disease, 337.
Manchurian water rice 385.
Mancono, 156.
Marasmius Raffillii, *Massee*, 374.
Marine algae, New Zealand, notes on, 239.
— —, West of Ireland, 312.
Marsilea Drummondii, 14.
Massee, G., 150.
Matsumuria, *Hemsl.*, gen. nov., 360.
— Oldhami, *Hemsl.*, 361.
Megaclinium purpureorachis, 349.
Michelia, alkaloid, 413.
Micholitzia, *N. E. Brown*, gen. nov., 358.
— obcordata, *N. E. Brown*, 358.
Microlepia Speluncae, var. hirta, 423.
Microloma spinosum, *N. E. Brown*, 307.
— tenuifolium, 227.
Microtea Burchellii, *N. E. Br.*, 135.
— polystachya, *N. E. Br.*, 135.
— tenuissima, *N. E. Br.*, 134.
Microtropis, American species of, 362.
— filipes, *Sprague*, 363.
— guatemalensis, *Sprague*, 364.
Miles, A. C., 22.
Miscellaneous notes, 22, 68, 150, 193, 224, 277, 315, 342, 390, 424.
Monadenium invenustum, *N. E. Brown*, 329.
— Lugardae, *N. E. Br.*, 138.
Monotes caloneurus, 226.
— glaber, *Sprague*, 305.
Mormodes revolutum, *Rolfe*, 367.
Mummy cloth, 76.
— coffin wood, 74.
Mussaenda Treutleri, 227.
'Mustard,' 14.
Mycosphaerella citrullina (with plate), 292,
Myrionema strangulans, 239.
Myrobalans, 209.

N.

Napoleona, saponin, 413.
Nardoo, 14.
Nectaropetalum and Peglera, 188.
Nectria funtumiae, *Massee*, 147.
Nemesia lilacina, *N. E. Brown*, 376.
Neodrega, *C. H. Wright*, gen. nov., 308.
— Glassii, *C. H. Wright*, 309.
Nepeta Wellmanii, *C. H. Wright*, 380.
Nephrodium (Lastrea) lichiangense, *C. H. Wright*, 267.
— molle, 424.
— molle, var. major, 424.
— moulmeinense, 424.

New Zealand marine algae, notes on, 239.
Ngamiland, flora of (with map), 81.
Nicodemia, saponin, 413.
Nigella integrifolia, 151.
'Nigeria, The Useful Plants of,' 427.
Nitophyllum variolosum, 241.
Nyankom, 348.

O.

Oak stake, ancient British, 346.
Oberonia umbraticola, *Rolfe*, 62.
Obituary notices :—
Annesley, Earl, 72.
Chantre, Césare, 391.
Greshoff, Dr. M., 424.
Jones, Sir A., 425.
King, Sir George, 68.
Rodrigues, J. B., 225.
Smythe, C. W., 391.
Whyte, A., 24.
Octomeria arcuata, *Rolfe*, 61.
Oil palm, economic aspects of, 161.
— — in West Africa (with figs.), 33.
Oldenburgia, saponin and tannin, 413.
Olea macrocarpa, *C. H. Wright*, 186.
Olearia, saponin, 413.
Oligobotrya Henryi, 74.
Oncidium anfractum, *Rolfe*, 367.
Opuntia imbricata, 428.
Orchids, new, 61, 364.
Ornithidium bicolor, *Rolfe*, 64.
Osborn, A., 193.
Oxygonum fasciculatum, *C. H. Wright*, 186.
— pubescens, *C. H. Wright*, 187.
Oxytenanthera Alopecurus, *Stapf*, 266.
Oxytropis, hydrocyanic acid and saponin, 413.

P.

Padi, examination of, at Kew, 277.
Paliurus, methyl salicylate, 413.
Palm oil, 171.
— wine, 177.
Palo amarillo, 392.
Pandiaka deserti, *N. E. Br.*, 134.
'Para rubber, cultivation and preparation of,' 320.
Parakeelya, 16.
Paronychia, saponin, 414.
Parthenocissus tricuspidata, 428.
Pastasa and Bombonasa rivers, vegetation of, 216.
Pasture herbs, Australian, 12.
Peglera and Nectaropetalum, 188.
Pelargonium brevipetalum, *N. E. Brown*, 184.
— Woodii, *N. E. Brown*, 306.
Peliosanthes violacea, var. Clarkei, 349.
Peperomia crassifolia, *Baker*, 214.
Peraphyllum, hydrocyanic acid, 414.
Phalaenopsis Wilsoni, *Rolfe*, 65.
Phalaris bulbosa, 289.
— commutata, 79, 289.
Phellomyces sclerotiophorus, 17.
Philadelphus, saponin, 414.
Philippine species of Impatiens, 281.
Phillyrea, saponin, 414.
Phyllanthus chiapensis, *Sprague*, 264.
Phytochemical investigations at Kew, 397.
Phytolacca, saponin, 414.
Pieris formosa, 395.
Pigweed, 13,
Pilocarpus racemosus, 76.
Pinus Bungeana, 74.
— Jeffreyi, 279.
Piper brachyrhachis, *C. H. Wright*, 214.
—, saponin, 417.
Pittosporum, saponin and tannin, 414.
Plantago varia, 15.
Plantain, Australian native, 15.
Platanus, hydrocyanic acid, 415.
Plectranthus Bolusii, *T. Cooke*, 377.
— Cooperi, *T. Cooke*, 377.
— densiflorus, *T. Cooke*, 378.
— Peglerae, *T. Cooke*, 378.
— villosus, *T. Cooke*, 378.
— zuluensis, *T. Cooke*, 379.
Pleurothallis attenuata, *Rolfe*, 364.
— Birchenallii, *Rolfe*, 365.
Pluchea Leubnitziae, *N. E. Br.*, 117.
Pogostemon Rogersii, *N. E. Brown*, 379.
Polemonium, saponin, 415.
Poliothyrsis sinensis, 355.
Pollinia leptantha, *Stapf*, 266.
Polygonum Schinzii, *C. H. Wright*, 187.
Polypodium callophyllum, *C. H. Wright*, 362.
— minimum, 424.
— subevenosum, 424.
— subpinnatifidum, 424.
Polystachya campyloglossa, *Rolfe*, 366.
— stricta, *Rolfe*, 63.
Portulaca kermesiana, *N. E. Br.*, 91.
Potatoes, dry scab of (with figs.), 16.
Potentilla, geraniol, 415.
Pouteria suavis, 228.
Prinsepia sinensis, 354.
Prior's Jamaica collection, revision of, 317.
Prosopis, saponin, 416.
Protea Elliottii, *C. H. Wright*, 328.
—, hydrocyanic acid, 416.
— Kirkii, *C. H. Wright*, 328.
— trichanthera, *Baker*, 329.
Prunus japonica, 279.
— maritima, 428.
Prussic acid, 400.
Pseuderanthemum seticalyx 151.
Psoralea, saponin, 416

Psoralea tenax, 15.
Ptelea, saponin, 416.
Pteris aquilina, 407.
— quadriaurita, var. hamulosa, 423.
Pycnocoma hirsuta, *Prain*, 51.
Pyrus Pashia, var. Kumaoni, 228.
— Ringo, 318.

Q.

Quinoa, 425.

R.

Raphionacme utilis (with plate and figs.), 321.
Rehmannia Henryi, *N. E. Brown*, 262.
Rhagodia hastata, 32.
— linifolia, 32.
— *nutans*, 32.
— parabolica, 32.
Rhodendron coombense, 395.
Rhus kwebensis, *N. E. Br.*, 100.
Rice, Canadian wild (with plate), 381.
—, Manchurian water, 385.
—, process of cleaning, in Lower Bengal, 229.
Rodrigues, J. B., 225.
Roupala, saponin and tannin, 416.
Rubber, Asclepias stellifera, 345.
—, B'tinga, 321.
—, Ecanda, 321.
—, Palo amarillo, 392.
— 'Para, cultivation and preparation of,' 320.
— plant, new, 345.
Rubi, Kew, 369.
Rubus canadensis, 318.
— Koehneanus, 151.
— omeiensis, *Rolfe*, 259.
— Veitchii, *Rolfe*, 258.
Rumex Woodii, *N. E. Brown*, 187.
Ruscus, saponin, 416.

S.

Saccolabium (Calceolaria) platycalcaratum, *Rolfe*, 368.
Sago, wild, 15.
Salsola congesta, *N. E. Brown*, 50.
— somalensis, *N. E. Brown*, 50.
Saltbushes, Australian, 30.
Sambucus, notes on the Indian species of, 191.
Saponin, 401.
Saururus, saponin, 416.
Savatier herbarium, 148.
Saxegothea conspicua, 335.
Saxifraga scardica, 151.
— —, var. obtusa, 151.
—, tannin, 412.
Schizoglossum auriculatum, *N. E. Brown*, 419.
Schizoglossum decipiens, var. flavum, *N. E. Brown*, 419.
Schleichera, hydrocyanic acid, 402.
Sebaea pusilla, var. major, *A. W. Hill*, 49.
Securinega, hydrocyanic acid, 417.
Selago immersa, *Rolfe*, 420.
Setaria surgens, *Stapf*, 265.
Sierra Leone, oil palm in, 41.
Silphium albiflorum, 343.
Singapore, fungi from, 204.
Sinofranchetia sinensis, 355.
Sinowilsonia Henryi, 355.
Sisyranthus Franksiae, *N. E. Brown*, 419.
Smythe, C. W., 391.
Snake bite, remedies for, 156, 343.
Sobralia valida, *Rolfe*, 65.
Sorbus cuspidata, 279.
— Vilmorini, 74.
South African bamboo, 59.
Southern Nigeria, oil palm in, 35.
Spermacoce deserti, *N. E. Br.*, 115.
Sphaerostilbe flavida, *Massee*, (with figs.) 337.
Spiraea Henryi, 319.
—, hydrocyanic acid, 417.
—, saponin and tannin, 417.
Spondylocladium atrovirens (with figs.), 16.
Spruce, R., vegetation of Pastasa and Bombonasa rivers, 216.
Stachys Cooperi, *Skan*, 420.
— malacophylla, *Skan*, 421.
Stanhopea convoluta, *Rolfe*, 366.
Stapf, Dr. O., 24.
Stauropsis Quaifei, *Rolfe*, 64.
Stevenstone, trees at, 337.
Stipa and other grasses, hydrocyanic acid, 417.
Stockdale, F. A., 150.
Strete Ralegh, trees at, 335.
Strobilomyces paradoxus, *Massee*, 209.
Strophanthus Preussii, 227.
Strychnos barbata, *A. W. Hill*, 359.
— cuspidata, *A. W. Hill*, 359.
— Forbesii, *A. W. Hill*, 360.
— ovata, *A. W. Hill*, 360.
Sugar-canes, experiments with, in Barbados, 77.
Sycopsis sinensis, 356.
Symphoricarpus, saponin, 417.

T.

Tannin, 400.
Tapiscia sinensis (with plate), 356.
Tap-root disease of coffee, 341.
Tephrosia contorta, *N. E. Br.*, 103.
Terminalia Chebula, 209.
— mucronata, *Craib et Hutchinson*, 358.

Tetracentron sinense, (with plate), 356.
Tetragonia expansa, 16.
—, saponin, 418.
Thesium dissitum, *N. E. Br.*, 137.
Thunbergia aurea, *N. E. Br.*, 127.
Thymus, citral, 418.
—, thymol, 418.
Timbers :—
Kokoti, 309.
Lignum Vitae, a substitute for, 156.
Makruss, 201.
Mummy coffin wood, 74.
Nyankom, 348.
Zimbiti, 201.
Togoland, oil palm in, 43.
Tomato canker (with plate), 292.
Toowoomba Canary grass, 289.
Toxanthera kwebensis, *N. E. Br.*, 113.
— Lugardae, *N. E. Br.*, 112.
Tragia (Tagira) Brouniana, *Prain*, 51.
— — gallabatensis, *Prain*, 51.
— — Gardneri, *Prain*, 52.
— — impedita, *Prain*, 52.
— — Schweinfurthii, *Baker*, 308.
Trees and shrubs, effects of the winter on, 233.
— — —, new, garden notes on, 353.
— noted in Devonshire, 334.
Trichocaulon pictum, *N. E. Brown*, 307,
Trigonella suavissima, 12.
Trigonostemon thyrsoideum, *Stapf*, 264.
Triplochiton nigericum, *Sprague*, 212.
Triumfetta plumigera, 258.
— ramosa, *Sprague et Hutchinson*, 257.
— triandra, *Sprague et Hutchinson*, 258.
Trollius, saponin, 418.
Tsuga Brunoniana, 335.
Turner, F., Australian pasture herbs, 12.
Tylostemon grandifolius, *Stapf*, 216.
— (Ennearrhena) sessilifolius, *Stapf*, 215.

U.

Umbellularia, hydrocyanic acid, 418.
Uruguay, a new fruit from, 228.
'Useful Plants of Nigeria,' 427.

V.

Vernonia angolensis, *N. E. Br.*, 116.
— aurantiaca, *N. E. Br.*, 116.
— crassipetala, *N. E. Br.*, 117.
— Dalzelliana, *Drummond et Hutchinson*, 261.
— lutea, *N. E. Br.*, 116.
— vitellina, *N. E. Br.*, 116.
Viburnum, saponin, 418.
Viruela coffee disease, 337.
Vitis inconstans, 428.

W.

Wahlenbergia okavangensis, *N. E. Br.*, 118.
Walleria muricata, *N. E. Br.*, 145.
Warrigal cabbage, 16.
West Africa, oil palm in, 33.
— Indian Reports, 77.
Whyte, A., 24.
Wild Fauna and Flora of Kew, additions to (with plate), 243, 369.
Willis, Dr. J. C., 'Agriculture in the Tropics,' 395.
Winter, effects of, on trees and shrubs at Kew, 233.
Witches' broom of Cacao, 223.
Wolffia denticulata, 394.
Worsdell, W. C., 22.
Wright, C. H., 24, 150.

X.

Xanthisma, saponin, 418.
Xanthostemon Verdugonianus, 156.
Xylia Kerrii, *Craib et Hutchinson*, 357.
Xylomelum, saponin, 418.

Z.

Zimbiti (with figs.), 201.
Zizania aquatica (with plate), 381.
— latifolia, 385.

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

APPENDIX I.—1909.

LIST OF SEEDS OF HARDY HERBACEOUS PLANTS AND OF TREES AND SHRUBS.

The following is a select list of seeds of Hardy Herbaceous Plants and of Hardy Trees and Shrubs which, for the most part, have ripened at Kew during the year 1908. These seeds are available only for exchange with Botanic Gardens, as well as with regular correspondents of Kew. No application, except from remote colonial possessions, can be entertained after the end of February.

HERBACEOUS PLANTS.

Acaena macrostemon.
microphylla.
Novae-Zealandiae.

Achillea Ageratum.
alpina.
macrophylla.

Aconitum uncinatum.
vulparia.
Wilsoni.

Actaea spicata.
— var. rubra.

Actinomeris squarrosa.

Adesmia muricata.

Adlumia cirrhosa.

Adonis autumnalis.
vernalis.

Aethionema cappadocicum.
grandiflorum.

Agrimonia odorata.
repens.

Agropyron acutum.
junceum.
tenerum.

Agrostis alba.
elegans.
nebulosa.

Ajuga Chamaepitys.

1375 Wt 35 12/08 D & S 29 34322

Allium albo-pilosum.
atropurpureum.
giganteum.
karatiaviense.
margaritaceum.
narcissiflorum.
neapolitanum.
odorum.
Ostrowskianum.
pulchellum.
Schuberti.
subvillosum.
Suworowi.
Tubergeni.
zebdanense.

Alonsoa linearis.
linifolia.
Warscewiczii.

Alstroemeria aurantiaca.
haemantha.

Althaea armeniaca.
ficifolia.
kurdica.
pontica.
rosea.
sulphurea.
taurinensis.

Alyssum argenteum.
creticum.
gemonense.
incanum.
nebrodense.
podolicum.
rostratum.
spinosum.

Amaranthus caudatus.
Dussii.
polygamus.
retroflexus.
speciosus.

Amellus annuus.

Amethystea caerulea.

Ammi Visnaga.

Ammobium alatum.

Ammophila arundinacea.

Anacyclus officinarum.
radiatus.

Anarrhinum bellidifolium.

Anchusa capensis.
italica.

Androsace maxima.

Andryala integrifolia.

Anemone baldensis.
parviflora.
Pulsatilla.
— var. lilacina.
rivularis.
sylvestris.

Angelica dahurica.

Anoda hastata.
Wrightii.

Anthericum Liliago.

Anthoxanthum Puelii.

Anthriscus cerefolium.
nemorosa.

Antirrhinum Orontium.

Apera interrupta.
Spica-Venti.

Aplopappus croceus.

Aquilegia alpina.
canadensis.
chrysantha.
glandulosa.
olympica.

Arabis alpina.
arenosa.
purpurea.
Stelleri var. japonica.

Arctium nemorosum.

Arenaria cephalotes.
foliosa.
graminifolia.
grandiflora.
gypsophiloides.
liniflora.
montana.
pinifolia.

Argemone grandiflora.
hispida.
platyceras.

Aristida adscensionis.

Armeria canescens.
juncea.
latifolia.
majellensis.
plantaginea.

Arnica Chamissonis.
longifolia.
montana.
Parryi.
sachalinensis.

Arthraxon ciliaris.

Asperella Hystrix.

Asperula azurea.
ciliata.
galioides.

Asphodeline Balansae.
liburnica.

Asphodelus albus.

Aster alpinus.
foliaceus.
radula.

Astilbe chinensis.
Davidii.

Astragalus alopecuroides.
boeticus.
chinensis.
chlorostachys.
Echinus.
frigidus.
Glyciphyllos.
mollis.
pentaglottis.

Astrantia Biebersteinii.
neglecta.

Athamanta Matthioli.

Atriplex littoralis.
rosea.
sibirica.

Atropa Belladonna.

Aubrietia Pinardi.

Baeria coronaria.

Baptisia australis.
leucantha.

Barbarea arcuata.
stricta.

Basella rubra.

Beckmannia erucaeformis.

Beta trigyna.

Bidens leucantha.

Biserrula Pelecinus.

Biscutella auriculata.
ciliata.
laevigata.

Blumenbachia insignis.
muralis.

Bocconia microcarpa.

Borago laxiflora.

Bouteloua curtipendula.

Brachycome iberidifolia.

Brachypodium caespitosum.
distachyum.
japonicum.
pinnatum.
sylvaticum.

Brassica alba.
campestris.
— var. chinensis.
Cheiranthos.
Erucastrum.
juncea.
rugosa.

Brevoortia Ida-Maia.

Briza geniculata.
maxima.
minor.

Bromus adoënsis.
albidus.
breviaristatus.
carinatus.
ciliatus.
japonicus.
Kalmii.
macrostachys.
madritensis.
marginatus.
maximus.
Porteri.
pumpelianus.
Richardsoni.
rubens.
secalinus.
squarrosus.
Tacna.
Trinii.
unioloides.

Buchloë dactyloides.

Bulbinella Hookeri.

Bunias orientalis.

Buphthalmum salicifolium.

Bupleurum Candollei.
glaucum.
longifolium.
ranunculoides.
rotundifolium.

Calamagrostis confinis.
epigeios.
varia.

Calandrinia Menziesii.
pilosiuscula.

Calceolaria mexicana.
polyrrhiza.

Callirhoë pedata.

Callistephus hortensis.

Calystegia sylvatica var. rosea.
sepium var. dahurica.

Camassia Cusickii.
esculenta.
Fraseri.
Leichtlinii.
montana.

Camelina sativa.

Campanula alliariaefolia.
bononiensis.
Imeretina.
lactiflora.
latifolia.
longistyla.
patula.
ramosissima.
Scheuchzeri.
thyrsoides.

Capsella Heegeri.

Carbenia benedicta.

Cardamine carnosa.
chenopodifolia.

Carduus cernuus.
niveus.

Carex arctata.
Buchanani.
crinita.
depauperata.
paniculata.
pendula.

Carlina acaulis.

Carthamus leucocaulos.
tinctorius.

Carum buriacticum.
copticum.

Catananche cærulea.

Cedronella cana.
triphylla.

Cenia turbinata.

Centaurea atropurpurea.
cynaroides.
dealbata.
pulchra.
rupestris.
ruthenica.

Centranthus macrosiphon.
Sibthorpii.

Cephalaria alpina.
tatarica.
transsylvanica,

Cerastium Biebersteinii.
tomentosum.

Chaenostoma foetidum.

Chaerophyllum aromaticum.
aureum.
nodosum.

Chelone Lyoni.
obliqua.

Chenopodium Bonus-Henricus.
urbicum.
virgatum.

Chloris barbata.
elegans.

Chlorogalum pomeridianum.

Chorispora tenella.

Chrysanthemum caucasicum.
cinerariaefolium.
corymbosum.
Haussknechtii.
setabense.

Chrysopogon Gryllus.

Cicer arietinum.
pinnatifidum.

Cimicifuga cordifolia.
racemosa.

Cladium Mariscus.

Clarkia elegans.
pulchella.
virgata.

Clematis diversifolia.

Cleome violacea.

Clypeola Jouthlaspi.

Cnicus arachnoideus.
canus.
syriacus.

Cochlearia danica.

Coix Lacryma-Jobi.

Collinsia bartsiaefolia.
bicolor.
verna.

Collomia gilioides.
grandiflora.
linearis.

Commelina coelestis.

Conringia orientalis.

Convolvulus farinosus.
siculus.
tricolor.
undulatus.

Coreopsis auriculata.
coronata.
tinctoria.

Coriandrum sativum.

Cornucopiae cucullatum.

Coronilla elegans.
scorpioides.

Corydalis cheilanthifolia.
glauca.
racemosa.
rosea.
vesicaria.

Corynephorus canescens.

Cosmos diversifolius.

Crambe hispanica.

Crepis blattarioides.
grandiflora.
rubra.
sibirica.

Crocus alatavicus.
aureus.
biflorus var. Weldeni.
candidus.
chrysanthus.
Fleischeri.
hadriaticus.
Imperati.
iridiflorus.
Korolkowi.
longiflorus.
medius.
nudiflorus.
reticulatus.
Salzmanni.
versicolor.

Crucianella aegyptiaca.

Cucubalus baccifer.

Cuminum Cyminum.

Cuphea Zimapani.

Cuscuta Gronovii.

Cynodon Dactylon.

Cynoglossum cheirifolium.
microglochin.
pictum.
Wallichii.

Cynosurus echinatus.

Cyperus vegetus.

Dactylis Aschersoniana.

Danthonia Thomasoni.

Datura ceratocaula.

Delphinium Barlowi.
Brunonianum.
dyctiocarpum.
elatum.
Geyeri.
grandiflorum.
hybridum.
Maackianum.
occidentale.
pictum.
Pylzowi.
speciosum.
— var. glabratum.
— var. turkestanicum.

Demazeria sicula.

Deschampsia caespitosa.
calycina.

Desmodium canadense.

Dianthus caesius.
capitatus.
cruentus.
giganteus.
petraeus.
pungens.
Seguieri.
superbus.
Waldsteini.

Dictamnus albus.

Digitalis ambigua.
ferruginea.
lanata.
lutea.
media.
tomentosa.

Dipcadi serotinum.

Diplachne fusca.

Dipsacus asper.
atratus.
Fullonum.
inermis.
plumosus.

Dischisma arenarium.

Dodartia orientalis.

Dodecatheon Meadia.

Dorycnium rectum.

Downingia elegans.

Draba alpina.
altaica.
carinthiaca.
frigida.
grandiflora.
hirta.
incana.

Dracocephalum Moldavicum.
peregrinum.
Ruyschiana.
— var. japonicum.

Drypis spinosa.

Dulichium spathaceum.

Ecballium Elaterium.

Echinaria capitata.

Echinocystis lobata.

Echinodorus ranunculoides.

Echium plantagineum.
rubrum.

Ehrharta panicea.

Eleusine coracana.
stricta.

Elsholtzia cristata.

Elymus canadensis.
Caput-Medusae.
condensatus.
giganteus.

Emilia flammea.

Encelia calva.

Epilobium Dodonaei.

Eragrostis curvula.
elegans.
maxima.
pilosa.

Erigeron alpinus.
glabellus.
macranthus.
neo-mexicanus.

Erinus alpinus.

Erodium Botrys.
ciconium.
malachoides.
Manescavi.
romanum.

Eruca sativa.

Eryngium amethystinum.
ebracteatum.
giganteum.
maritimum.
planum.

Erysimum arkansanum.
Perofskianum.
pumilum.

Erythronium Hendersoni.
Johnsoni.
revolutum.

Eschscholzia caespitosa.

Eucharidium Breweri.
concinnum.

Eupatorium ageratoides.

Euphorbia altissima.
coralloides.

Felicia fragilis.
tenella.

Ferula Jaeschkeana.
Sumbul.
syriaca.

Festuca bromoides.
Eskia.
glauca.
Halleri.
heterophylla.
Myuros.
rigida.
tenuiflora.

Foeniculum dulce.
Panmorium.
virescens.

Fragaria Daltoniana.

Fritillaria acutiloba
askabadensis.
Tuntasia.

Funkia ovata.
Sieboldiana.

Gaillardia amblyodon.
aristata.

Galax aphylla.

Galega orientalis.

Galeopsis pyrenaica.
Tetrahit.

Gastridium australe.

Gaudinia fragilis.

Gentiana asclepiadea.
lutea.
tibetica.

Geranium albanum.
albiflorum.
Endressi.
grandiflorum.
incisum.
nepalense.
nodosum.
palustre.
polyanthes.

Gerbera Anandria.
Bellidiastrum.
Kunzeana.
nivea.

Geum Heldreichii.
reptans.
triflorum.

Gilia androsacea.
capitata.
liniflora.
squarrosa.
tricolor.

Gillenia trifoliata.

Glaucium corniculatum.
flavum.
— var. fulvum.

Glyceria plicata.

Glycine Soja.

Grindelia robusta.
squarrosa.

Guizotia abyssinica.

Gymnolomia multiflora.

Gypsophila acutifolia.
elegans.
muralis.
Steveni.
viscosa.

Halenia Perrottetii.

Haplocarpha scaposa.

Hastingia alba.

Hebenstreitia comosa.
tenuifolia.

Hedysarum coronarium.
esculentum.
microcalyx.
neglectum.

Helenium Bigelovii.

Helianthemum ledifolium.
Tuberaria.

Helianthus Nuttallii.
tuberosus.

Helichrysum bracteatum.
foetidum.

Heliophila amplexicaulis.
crithmifolia.
pendula.
pilosa.

Helipterum corymbosum.
Manglesii.
roseum.

Herniaria glabra.
hirsuta.

Hesperis matronalis.

Heterospermum Xanti.

Heuchera pubescens.

Hibiscus Trionum.

Hieracium amplexicaule.
aurantiacum.
Bornmülleri.
pannosum.
villosum.

Hilaria rigida.

Hippocrepis multisiliquosa.
unisiliquosa.

Hordeum bulbosum.
crinitum.
jubatum.

Hosackia Purshiana.

Hunnemannia fumariaefolia.

Hyacinthus amethystinus.
azureus.

Hydrophyllum virginicum.

Hymenophysa pubescens.

Hyoscyamus albus.

Hypecoum grandiflorum.
procumbens.

Hypericum hirsutum.

Iberis Amara.
pinnata.
Tenoreana.

Impatiens fulva.
Noli-tangerre.
scabrida.

Incarvillea Delavayi.

Inula macrocephala.
montana.
racemosa.
Royleana.

Ionopsidium acaule.

Iris albo-purpurea.
bracteata.
Clarkei.
Douglasiana.
graminea.
longipetala.
missouriensis.
setosa.
tenax.
Watsoniana.

Isatis glauca.

Isopyrum fumarioides.

Juncus alpinus.
Chamissonis.

Jurinea alata.
ambigua.
spectabilis.

Kitaibelia vitifolia.

Kniphofia Tysoni.

Kochia arenaria.
scoparia.

Koeleria albescens.
phleoides.
setacea.

Lactuca Bourgaei.
hastata.

Lagascea mollis.

Lagurus ovatus.

Lallemantia canescens.
iberica.
peltata.
Royleana.

Lamarckia aurea.

Laserpitium Siler.

Lathyrus angulatus.
Aphaca.
articulatus.
Cicera.
Clymenum.
filiformis.
luteus.
montanus.
Nissolia.
Ochrus.
polyanthus.
rotundifolius.
setifolius.
sphaericus
tingitanus.
tuberosus.
variegatus.
venosus.

Lavatera cachemiriana.
thuringiaca.
trimestris.

Layia elegans.
glandulosa.

Lens esculenta.

Leonurus Cardiaca.
sibiricus.
tataricus.

Lepachys columnaris.

Leptosyne maritima.
Stillmanni.

Lepturus cylindricus.

Ligusticum pyrenaicum.
scoticum.
Seguieri.

Lilium giganteum.
tenuifolium.

Limnanthes alba.
Douglasii.

Linaria anticaria.
bipartita.
Broussonetii.
dalmatica.
maroccana.
origanifolia.
reticulata.
saxatilis.
triphylla.
tristis.
viscida.

Linum angustifolium.
flavum.
monogynum.
nervosum.
usitatissimum.

Loasa hispida.
lateritia.
vulcanica.

Lolium multiflorum.
temulentum.

Lopezia coronata.
mexicana.

Lotus ornithopodioides.
Requienii.
Tetragonolobus.

Lunaria biennis.

Lupinus arboreus.
Barkeri.
Cruckshanksii.
elegans.
Hartwegii.
micranthus.
nanus.
nootkatensis.
pubescens.
sulphureus.
tricolor.

Luzula albida.
nivea.

Lychnis alpina.
coronaria.
corsica.
Flos-jovis.
Haageana.

Lysimachia barystachya.
punctata.

Lythrum hyssopifolia.

Madia dissitiflora.
elegans.
sativa.

Malcolmia chia.
flexuosa.

Malope trifida.

Malva Alcea.
Duriaei.
moschata.
oxyloba.

Malvastrum limense.

Mandragora officinarum.

Martynia lutea.
proboscidea.

Matthiola bicornis.
tricuspidata.

Meconopsis aculeata.
cambrica.
simplicifolia.
sinuata var. latifolia.
Wallichii.

Medicago Echinus.
Helix.
littoralis.
orbicularis.
scutellata.
turbinata.

Melica altissima.
ciliata.
papilionacea.
uniflora.

Melilotus alba.

Mesembryanthemum pyropeum.
pomeridianum.

Meum Athamanticum.

Milium effusum.

Mimulus cardinalis.
luteus.

Molinia cœrulea.

Molopospermum cicutarium.

Monolepis trifida.

Moricandia arvensis.

Morina longifolia.

Moscharia pinnatifida.

Muscari armeniacum.
comosum.
compactum.
latifolium.
paradoxum.
parviflorum.
Szovitzianum.

Myagrum perfoliatum.

Myosuros minimus.

Nardus stricta.

Nemesia strumosa.

Nemophila Menziesii.

Nepeta Mussini.
nuda.

Nertera depressa.

Neslia paniculata.

Nicandra physaloides.

Nicotiana Langsdorffii.
paniculata.
rustica.

Nigella damascena.
hispanica.
integrifolia.
orientalis.
sativa.

Nolana prostrata.

Ochthodium aegyptiacum.

Œnanthe pimpinelloides.
silaifolia.

Œnothera densiflora.
nocturna.
pumila.
tenella.

Omphalodes linifolia

Ononis alopecuroides.
hircina.
Natrix.
rotundifolia.

Ornithopus sativus.

Ostrowskia magnifica.

Oxyria digyna.

Panicum bulbosum.
capillare.
Isachne.
miliaceum.
Teneriffae.

Papaver alpinum.
apulum.
arenarium.
Argemone.
commutatum.
glaucum.
orientale.
pavoninum.
rupifragum.
somniferum.

Paspalum dilatatum.

Pelargonium australe.

Pennisetum longistylum.
macrourum.
Ruppellii.
typhoideum.

Pentstemon campanulatus.
confertus.
deustus.
diffusus.
gentianoides.
heterophyllus.
ovatus.
pubescens.
secundiflorus.
virgatus.

Pericome caudata.

Petunia nyctaginiflora.

Phacelia malvaefolia.
Parryi.
viscida.

Phleum arenarium.
alpinum.

Physalis Alkekengi.
Francheti.
peruviana.

Phlomis tuberosa.
viscosa.

Phuopsis stylosa.

Physochlaina orientalis.

Phyteuma canescens.
humile.
Michelii.
nigrum.
orbiculare.
spicatum.

Phytolacca acinosa.
bogotensis.

Picridium tingitanum.

Plantago amplexicaulis.
Candollei.
Coronopus.
Lagopus.
maritima.
maxima.
ovata.
Psyllium.
tibetica.

Platycodon grandiflorum.

Platystemon californicus.

Pleurospermum Golaka.

Plumbago micrantha.

Poa abyssinica.
nevadensis.
violacea.

Podolepis gracilis.

Podophyllum Emodi.

Polemonium mexicanum.
pauciflorum.

Polygonum alpinum var. polymorphum.
molle.
orientale.
Posumbo.
viviparum.
Weyrichii.

Polypogon littoralis.
maritimus.
monspeliensis.

Polypteris callosa.
texana.

Portulaca grandiflora.

Potentilla argentea.
arguta.
argyrophylla.
Detommasii.
gelida.
glandulosa.
gracilis.
Griffithii.
hirta.
leuconota.
mollis.
montenegrina.
nepalensis.
nivalis.
pedunculatis.
pyrenaica.
recta.
sericea.
tanacetifolia.
Thurberi.
tridentata.

Poterium alpinum.
canadense.

Pratia angulata.
begonifolia.

Prenanthes altissima.

Primula frondosa.
japonica.
pulverulenta.
rosea.
sikkimensis.

Psoralea macrostachya.
physodes.

Ramondia pyrenaica.

Ranunculus asiaticus.
brutius.
Chius.
falcatus.

Rehmannia angulata.

Relhania sessilifolia.

Reseda glauca.
virgata.

Rhagadiolus edulis.

Rheum Emodi.
Rhaponticum.
Webbianum.

Rodgersia pinnata.
podophylla.
tabularis.

Roemeria hybrida.

Romulea candida.
Columnae.
nivalis.
ramiflora.
Requienii.

Rudbeckia ampla.
amplexicaulis.
bicolor.
californica.

Rumex alpinus.
limosus.
salicifolius.

Salpiglossis variabilis.

Salsola Kali.

Salvia Aethiopis.
carduacea.
coccinea.
Columbariae.
dichroa.
glutinosa.
Horminum.
aponica.
nutans.
Przewalskii.
Schiedeana.
Sclarea.
Soulei.
taraxacifolia.
tiliaefolia.

Sambucus Ebulus.
— var. latifolius.

Saponaria calabrica.

Saussurea albescens.
discolor.

Saxifraga Brunoniana.
cartilaginea.
catalaunica.
cochlearis.
— var. minor.
Cotyledon.
Hostii.
lingulata.
— var. lantoscana.
Macnabiana.
peltata.
purpurascens.
rotundifolia.
Sibthorpii.
sponhemica.
tenella.

Scabiosa Boissieri.
brachiata.
candolleana.
caucasica.
dalmatica.
gramuntia.
isetensis.
leucophylla.
longifolia.
ochroleuca.
orientalis.
prolifera.
Pterocephala.
pyrenaica.
speciosa.
vestina.

Schizopetalon Walkeri.

Scilla hispanica.
patula.
peruviana.
pratensis.
verna.

Scopolia sinensis.

Scorpiurus vermiculata.

Scrophularia alata.
vernalis.

Scutellaria altissima.
indica var. japonica.

Secale cereale.
dalmaticum.

Securigera Coronilla.

Sedum caeruleum.

Selinum serbicum.
vaginatum.

Senecio alpinus.
Clivorum.
Doria.
lanatus.
Ledebouri.
Ligularia.
sagittatus.
sibiricus.
tanguticus.
Veitchii.

Serratula coronata.

Sesamum indicum.

Seseli globiferum.
Libanotis.
tortuosum.

Setaria glauca.
italica.
vulpiseta.

Sidalcea candida.
malvaeflora.
neo-mexicana.
spicata.

Silene alpestris.
Armeria.
asterias.
ciliata.
clandestina.
colorata.
conoidea.
cretica.
fimbriata.
Fortunei.
fuscata.
glauca.
italica.
juvenalis.
laeta.

Silene—*cont.*
linicola.
longicilia.
melandrioides.
Muscipula.
noctiflora.
nutans.
odontopetala.
pendula.
quadrifida.
rubella.
squamigera.
stylosa.
tatarica.
tenuis.
Zawadskii.

Silphium scaberrimum.
terebinthinaceum.
trifoliatum.

Silybum eburneum.
Marianum.

Sisymbrium polyceratum.
strictissimum.
tanacetifolium.

Sisyrinchium angustifolium.
chilense.
iridifolium.
striatum.

Solanum rostratum.

Spartina polystachya.

Specularia falcata.
Speculum.

Sphaeralcea acerifolia.

Spilanthes Acmella.

Spiraea lobata.

Sporobolus asper.
cryptandrus.
Wrightii.

Stachys Alopecuros.
graeca.
grandiflora.
lanata.
longifolia.

Statice Bonduelli.
sinuata.
Suworowi.

Stevia serrata.

Stipa argentea.
Calamagrostis.
capillata.
gigantea.
Lessingiana.
papposa.
pennata.
viridula.

Swertia longifolia.
perennis.

Symphyandra Hofmanni.
pendula.
Wanneri.

Symphytum asperrimum.

Synthyris reniformis.

Teesdalia regularis.

Tellima grandiflora.

Tetragonia crystallina.
expansa.

Teucrium Botrys.
canadense.

Thalictrum angustifolium.
aquilegifolium.
calabricum.
coloratum.
purpurascens.
squarrosum.

Thermopsis fabacea.
montana.

Thladiantha dubia.

Thlaspi perfoliatum.

Tradescantia congesta.

Trautvetteria palmata.

Tricyrtis latifolia.

Tridax trilobata.

Trifolium agrarium.
Alexandrinum.
alpestre.
glomeratum.
Johnstoni.
leucanthum.
maritimum.
pannonicum.
Perreymondi.
physodes.
scabrum.
spumosum.
stellatum.

Trigonella corniculata.
caerulea.
cretica.
Foenum-graecum.
ovalis.
polycerata.
radiata.

Trillium grandiflorum.
ovatum.

Triosteum perfoliatum.

Tripsacum dactyloides.

Trisetum distichophyllum.
flavescens.

Triticum Aegilops.
amyleum.
dicoccum.
monococcum.
ovatum.
polonicum.
speltoides.

Tulipa Batalini.
Kaufmanniana.
linifolia.
Lownei.
praestans.

Tunica Saxifraga.

Tyrimnus leucographis.

Ursinia pulchra.

Urtica pilulifera.
— var. balearica.

Valeriana pyrenaica.
sambucifolia.

Valerianella Auricula.
coronata.
dentata.
echinata.
eriocarpa.
vesicaria.

Veratrum nigrum.

Verbascum Blattaria.
longifolium.
phoeniceum.

Verbena bonariensis.
erinoides.

Verbesina encelioides.

Veronica glauca.
incana.
orchidea.
saxatilis.
virginica.
— var. japonica.

Vesicaria grandiflora.

Vicia atropurpurea.
calcarata.
gigantea.
hirsuta.
narbonensis.
pisiformis.
sicula.
sylvatica.
unijuga.

Vincetoxicum fuscatum.
nigrum.
officinale.

Viola arenaria.
cornuta.
mirabilis.
palustris.
persicifolia.
sagittata.
sylvestris.

Volutarella Lippii.
muricata.

Waitzia aurea.

Xanthium macrocarpum.

Xanthocephalum gymnospermoides.

Zaluzianskya capensis.

Ziziphora tenuior.

Zygadenus bracteatus.
elegans.
glaberrimus.

TREES AND SHRUBS.

Those marked with an asterisk were not grown at Kew.

---

*Abies brachyphylla.
*Veitchii.

Acanthopanax sessiliflorum.

Acer circinatum.
coriaceum.
insigne.
macrophyllum.
monspessulanum.
pennsylvanicum.
tataricum.
Trautvetteri.

Ailanthus glandulosa.

Alnus barbata.
cordifolia.
elliptica.
incana.
japonica.
orientalis.
subcordata.
viridis.

Amorpha canescens.
*nana.

Aplopappus ericoides.

Aralia chinensis.

Arbutus Andrachne.
Unedo.

Arundinaria Falconeri.

Berberis aetnensis.
aristata.
canadensis.
concinna.
Darwinii.
dictyophylla.
pachyacantha.
sinensis.
stenophylla.
umbellata.
Wallichiana.
yunnanense.

Betula davurica.
Ermani.
fruticosa.
lenta.
occidentalis.
papyrifera.
populifolia.

Bruckenthalia spiculifolia.

Buddleia albiflora.
Hemsleyana.
japonica.
variabilis.
— var. Veitchianus.

Caragana arborescens.
— var. Redowskii.
aurantiaca.
brevispina.
microphylla.

Carmichaelia australis.
flagelliformis.

Cassinia fulvida.
leptophylla.

Ceanothus americanus var. opacus.
Arnoldi.
thyrsiflorus.

Cedrus atlantica.

Celastrus articulatus.

*Celtis occidentalis.

Cephalotaxus drupacea.
Fortuni.
pedunculata.

Chimonanthus fragrans.

*Cistus corbariensis.
florentinus.
hirsutus.
laurifolius.
purpureus.
villosus.

Cladrastis amurensis.

Clematis connata.
fusca.
globosa.
montana var. rubra.
orientalis var. tangutica.

Clethra alnifolia.
— var. Michauxi.
canescens.

Colutea cruenta.
longialata.

Cornus Amomum.
candidissima.
circinata.
pubescens.
stolonifera.

Coronilla Emerus.

Cotoneaster affinis.
bacillaris.
bullata.
buxifolia.
frigida.
horizontalis.
lucida.
multiflora.
pannosa.
rotundifolia.
Simonsii.
thymifolia.

*Crataegus acutiloba.
Carrierei.
cordata.
Crus-Galli.
flava.
macracantha.
melanocarpa.

*Crataegus—*cont.*
mexicana.
nigra.
orientalis.
punctata.
rivularis.
succulenta.
tanacetifolia.
tomentosa.

Cupressus thyoides.

Cydonia Maulei.

Cytisus albus.
biflorus.
capitatus.
Heuffeli.
nigricans.
sessilifolius.

Daboëcia polifolia.

*Dammara australis.

Decaisnea Fargesii.

Desmodium viridiflorum.

Deutzia corymbosa.
crenata.

Diervilla rivularis.
sessilifolia.

Dorycnium hirsutum.

Eleutherococcus Henryi.

Erica ciliaris.
— var. Maweana.
multiflora.
stricta.
Watsoni.

Euonymus latifolius.
planipes.
verrucosus.

Exochorda Alberti.

*Fraxinus oregona.
Ornus.

Gaultheria procumbens.
Shallon.

Genista aethnensis.
germanica.
hispanica.
pilosa.
radiata.
virgata.

Helianthemum formosum.
halimifolium.

Hippophaë rhamnoides.

Hydrangea aspera.
petiolaris.
vestita.

Hymenanthera crassifolia.

Hypericum Androsaemum.
aureum.
*Coris.
densiflorum.
elatum.
hircinum.
Hookerianum.
inodorum.
patulum var. Henryi.
prolificum.
uralum.

Ilex cornuta.
opaca.
Sieboldii.
verticillata.

Indigofera Gerardiana.
hebepetala.

Jasminum fruticans.
humile.

Juniperus chinensis.
*rigida.

Kalmia glauca.
latifolia.

*Larix leptolepis.

Ledum palustre.

Lespedeza bicolor.

Leycesteria formosa.

Rosa Hugonis.
Soulieana.

Rubus biflorus.
crataegifolius.
leucodermis.
Millspaughii.
neglectus.
nutkanus.
occidentalis.
parvifolius.
phoenicolasius.
spectabilis.
villosus.
xanthocarpus.

Ruta graveolens.

Sambucus canadensis var. maxima.
glauca.

Securinega fluggeoides.

Shepherdia argentea.

Skimmia japonica.

Sophora viciifolia.

Spartium junceum.

Spiraea Aitchisoni.
assimilis.
Lindleyana.
salicifolia.

Staphylea colchica.
pinnata.

Stephanandra Tanakae.

Styrax japonica.

Symphoricarpus Heyeri.
racemosus.

Symplocos crataegoides.

Taxus cuspidata.

Thuya plicata.

*Tilia Maximowicziana.

Torreya nucifera.

Trachycarpus excelsus.

*Tricuspidaria dependens.
(Bot. Mag. t. 8115.)

Vaccinium corymbosum.
hirsutum.
pallidum.
*pensylvanicum.
*stamineum.

Viburnum dilatatum.
Wrightii.

*Vitis assamica.
*Coignetiae.

*Zanthoxylum alatum.
Bungei.

Zenobia speciosa.
— var. pulverulenta.

Lonicera alpigena.
depressa.
dioica.
etrusca var. superba.
glauca.
minutiflora.
Morrowii.
nigra.
oblongifolia.
obovata.
orientalis.
pileata.
pyrenaica.
segreziensis.
translucens.
Xylosteum.

Lupinus arboreus.

Lycium pallidum.

Lyonia ligustrina.

Magnolia tripetala.

*Metrosideros tomentosa.

Microglossa albescens.

Myrica cerifera.

Myricaria germanica.

Neillia amurensis.
capitata.
opulifolia.

Notospartium Carmichaeliae.

Nuttallia cerasiformis.

Olearia Haastii.

Ononis arragonensis.
fruticosa.
rotundifolia.

Paliurus australis.

Pernettya mucronata.

Petteria ramentacea.

Philadelphus coronarius var.
tomentosus.
Gordonianus.
grandiflorus.
Lewisii.

Phillyrea decora.

*Picea alba.
*hondoensis.

*Pinus koraiensis.
*mitis.
*Pinaster.
*Taeda.

*Platanus occidentalis.

*Podocarpus Totara.

Prunus acida var. semperflorens.
*americana.
emarginata.
japonica.
*maritima.
*orthosepala.
*pendula.
*pensylvanica.
*Pseudo-cerasus.
*siberica.
*Watsoni.

*Ptelea isophylla.
trifoliata.

Pyrus alpina.
arbutifolia.
Balansae.
canescens.
longipes.
nigra.
nivalis.
Ringo.
rotundifolia.
sikkimensis.
sinaica.
Toringo.
Tschonoskii.

Rhamnus cathartica.
crenata.
spathulifolia.

Rhodotypus kerrioides.

Rhus aromatica.

Ribes alpinum.
cruentum.
divaricatum.
mogollonicum.
pinetorum.
rotundifolium.

Robinia neo-mexicana.
viscosa.

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

APPENDIX II.—1909.

NOTE.

IN the preface to the *Catalogue of the Library of the Royal Botanic Gardens*, which was issued as Volume III. of the *Additional Series* of the *Kew Bulletin*, it was stated that annual lists of future additions would be published in the *Bulletin*.

The present instalment contains the additions made to the Library by gift or purchase during the year 1908, with the exception of such current periodicals and annuals as continue sets already catalogued.

Like the Catalogue, the List is printed on one side of the page, to allow of its being cut up. It is probable that many persons and institutions will make the Kew Catalogue the basis of their own, and will use the lists of additions to supply printed slips for fresh titles.

(12319—6*a*.) Wt. 35—183. 1375. 3/09. D & S. A

CATALOGUE OF THE LIBRARY.

Additions received or incorporated during 1908.

§ 1.—GENERAL.

Acebal, Ricardo. See **Birdwood, Sir G. C. M.**

Adam, Jean. Les plantes oléifères de l'Afrique occidentale française. I. L'Arachide. See **Africa.** Afrique occidentale française.

Africa. Afrique occidentale française. Inspection de l'Agriculture. Le Coton, par Yves HENRY. Paris, 1906. 8vo. —— Le Caoutchouc, par Yves HENRY. Ib., 1906. 8vo. —— L'Élevage, par C. PIERRE. Ib., 1906. 8vo. —— Les plantes oléifères. I. L'Arachide . . . par Jean ADAM. Ib., 1908. 8vo.

Inspecteur de l'Agric. de l'Afrique occid. franç.

Africa. Afrique occidentale française. Inspection de l'Agriculture et des Forêts. Campagne cotonnière de 1906, par Yves HENRY. Paris, 1907. 8vo.

Inspecteur de l'Agric. de l'Afrique occid. franç.

Africa. Afrique occidentale française. Colonie du Dahomey. L'Agriculture, par N. SAVARIAU. Paris, 1906. 8vo.

Inspecteur de l'Agric. de l'Afrique occid. franç.

Ährling, Johan Erick Ewald. Studier i den Linnéanska nomenclaturen och synonymiken. Afd. 1. Akad. Afhandl. Örebro, 1872. 8vo.

R. Univ., Upsala.

Aisslinger, Hans. Beiträge zur Kenntnis wenig bekannter Pflanzenfasern. Diss. Zürich-Selnau, 1907. 8vo.

H. Schinz.

Alemann, Conrad von, *of Magdeburg.* Das Buch der Natur von KONRAD VON MEGENBERG. Die erste Naturgeschichte in deutscher Sprache. Herausg. von Franz PFEIFFER. Stuttgart, 1861. 8vo.

Åmann, Nils N. *Resp.* Flora alpina. See **Linné, C. von.** 1756.

Åmark, Fredrik Wilhelm. Om Vigiliae plantarum, Lin. Akad. Afhandl. Stockholm, 1872. 8vo.

R. Univ., Upsala.

Ames Oakes. Orchidaceæ : illustrations and studies, &c. Fasc. 2–3. Boston, 1908. 8vo.

Author.

Anderson, Tempest. Report on the eruptions of the Soufrière in St. Vincent in 1902, and on a visit to Montagne Pelée in Martinique. Part II. The changes in the districts and the subsequent history of the volcanoes. [With] Petrographical notes . . . by J. S. FLETT. (Phil. Trans. Ser. A. ccviii.) (London, 1908.) 4to.

Tempest Anderson.

Arley. Hortus arleyensis. Catalogue of hardy trees and shrubs, including Coniferæ, growing in the grounds of Arley Castle. See **Woodward, R., Junr.**

Arnell, Hampus Wilhelm. Om vegetationens utveckling i Sverige, åren 1873–75. Akad. Afhandl. Upsala, 1878. 8vo.

R. Univ., Upsala.

Art of pruning fruit-trees, with an explanation of some words which gardiners make use of in speaking of trees, etc. Translated from the French original, set forth the last year by a physician of Rochelle. London, 1685. 8vo.

Aspelin, Elias. *Resp.* Flora oeconomica. See **Linné, C. von.** 1748.

Atlases. Atlas of Canada, prepared under the direction of James WHITE. [Ottawa] 1906. fol.

Governor-General of Canada.

Atlases. STIELER'S Hand-Atlas . . . herausg. von Justus PERTHES' Geogr. Anstalt. Ed. 9. Gotha, 1908. fol.

Atwood, Alice Cary. Catalogue of the botanical library of John Donnell SMITH, presented in 1905 to the Smithsonian Institution. (Contr. U.S. Nat. Herb. xii.) [Large paper edition.] Washington, 1908. 4to.

J. Donnell Smith.

Aulin, Fredrik Rutger. Anteckningar öfver Hafsalgernas geografiska utbredning i Atlantiska hafvet norr om Eqvatorn, i medelhafvet och Östersjön. Akad. Afhandl. Stockholm, 1872. 8vo.

R. Univ., Upsala.

Australia. Western Australia. Notes *re* Timbers of Western Australia suitable for railways, engineering works, and constructional purposes generally. Perth, 1906. fol.

Premier of Western Australia.

Australia. Western Australia. Western Australian Timber Tests, 1906. The physical characteristics of the Hardwoods of Western Australia, by G. A. JULIUS. Perth, 1906. fol. [Issued as a Supplement to the preceding Notes.]

Premier of Western Australia.

Australia. Western Australia. Supplement to the Western Australian Timber Tests, 1906. The physical characteristics of the Hardwoods of Australia, by G. A. JULIUS. Perth, 1907. 8vo.

Premier of Western Australia.

Avicenna. See **Ḥusain Ibn 'Abd Allāh.**

Axell, Severin. Om anordningarna för de fanerogama växternas befruktning. Akad. Afhandl. Stockholm, 1869. 8vo.
R. Univ., Upsala.

Bain, Samuel M., & Samuel H. Essary. Selection for disease-resistant clover : a preliminary report. (Bull. Agric. Exper. Stat. Tennessee, xix. n. 1.) Knoxville, 1906. 8vo.
S. M. Bain.

Barber, Kate G. See **Hanausek, T. F.** 1907.

Barck, Harald. *Resp.* Vernatio arborum. See **Linné, C. von.** 1753.

Barker, Thomas. A census catalogue of British Mosses. See **Moss Exchange Club.** 1907.

Basu, B. C. Note on the Lac Industry of Assam. (Bull. Agric. Dep. Assam, 6.) Shillong, 1900. 8vo.

Baylis, Edward. A new and compleat body of practical Botanic Physic, from the medicinal plants of the vegetable kingdom, etc. Vol. 1. London, 1791. 4to.

Beadle, Clayton. Chapters on papermaking, ii–v. London, 1907–08. 8vo.
Author (vol. v.).

Bean, William Jackson. The Royal Botanic Gardens, Kew : historical and descriptive. With an introduction by Sir William Thiselton-Dyer. [Large paper edition.] London, 1908. 4to.

Beccari, Odoardo. Le Palme americane della tribù delle *Corypheae.* (Martelli, Webbia, ii.) Firenze, 1907. 8vo.
Sir J. D. Hooker.

Bechstein, Johann Matthaeus. Forstbotanik, oder vollständige Naturgeschichte der deutschen Holzpflanzen und einiger fremden. Erfurt, 1815. 8vo.

Beck, Lewis Caleb. Botany of the United States north of Virginia, etc. Ed. 2. New York, 1868. 8vo.

Bentham George. Handbook of the British Flora, etc. Revised by Sir J. D. Hooker. [Ed. 8.] London, 1908. 8vo.

Bérard Victor. Les Phéniciens et l'Odyssée. Paris, 1902–03. 2 vols. 8vo.

Berg, Pehr Jonas. *Resp.* Semina Muscorum detecta. See **Linné, C. von.** 1750.

Berger, Alexander Mal. *Resp.* Calendarium floræ. See **Linné, C. von.** 1756.

Berger, Alwin. Liliaceae—Asphodeloideae—Aloineae. (Engler, Das Pflanzenreich, iv. 38. iii. ii.) Leipzig, 1908. 8vo.

Berlin, Anders Henrik. *Resp.* Usum Muscorum. See **Linné, C. von.** 1766.

Bernard, Charles. Protococcacées et Desmidiées d'eau douce, récoltées à Java et décrites par C. B. (Dép. Agric. Indes Néerland.) Batavia, 1908. 8vo.

Director of Agriculture, Dutch E. Indies.

Bessey, Charles Edwin. A synopsis of plant phyla. (University Studies, vii.) [Lincoln, Nebraska?] (1907.) 8vo.

Author.

Biberg, Isaac J. *Resp.* De oeconomia naturæ. See **Linné, C. von.** 1749.

Bibliotheca Botanica. Herausg. von C. LUERSSEN. Hefte 67-69, 71. Stuttgart, 1907–08. 4to. Heft 67, Studien über die Schwärmer einiger Süsswasseralgen, von A. PASCHER, 1907; Heft 68, Beiträge zur Kenntnis der Podostemaceen, von F. MATTHIESEN, 1908; Heft 69, Der Bau der Diatomeenzelle, etc., von O. HEINZERLING, 1908; Heft 71, Monographie der Gattung *Potentilla*, von T. WOLF, 1908.

Binz, August. Flora von Basel und Umgebung, etc. Ed. 2. Basel, 1905. 8vo.

Birdwood, Sir George Christopher Molesworth. Memorandum on the purchase in Europe of Carrot seed for the purposes of famine relief in Northern India. (Reprinted from the Official Report by James CARTER & Co.) (London) 1898. 4to.

Birdwood, Sir G. C. M., & Others. Reports on the cultivation of the Spanish Chestnut. [Historical introduction, by Sir G. C. M. B.—The use of Chestnuts for food in the consular districts of North Italy and East Tuscany, by Sir D. E. COLNAGHI.—The cultivation and production of Chestnuts in the Province of Asturias, Spain, by W. PENLINGTON.—The Chestnut Trees of Catalonia, by R. ACEBAL.—The use of Chestnuts as an article of food in Italy, by I. P. GAVAZZI & G. MALDIFASSI.] (London) 1892. fol.

Blandford, Walter F. H. Report on the destruction of beer-casks in India by the attacks of a boring beetle (*Xyleborus perforans*, Woll.). London, 1893. 8vo.

Blochwich, Martin. Anatomia Sambuci: or the anatomie of the Elder . . . Translated [by C. IRVINE.] London, 1655. 12mo.

Blom, Carl Magnus. *Resp.* Lignum Quassiæ. See **Linné, C. von.** 1763.

Blomberg, Albert. Om hybridbildning hos de fanerogama växterna. Akad. Afhandl. Stockholm, 1872. 8vo.

R. Univ., Upsala.

Bocat, Lucien. Sur le pigment de l' *Ocillatoria Cortiana* rouge. Analyse spectrale comparée. (Comptes rendus Soc. Biol. Bordeaux, Jan. 1908.) [Paris, 1908.] 8vo.

C. Sauvageau.

Bois, Désiré. Les plantes utiles de la Cochinchine et du Cambodge. (Bull. Comité de l' Asie franç.) Paris, 1906. 8vo.

Author.

Bonnet, Edmond. Essai d'identification des plantes médicinales mentionnées par DIOSCORIDE, etc. (Janus, viii.) (Harlem, 1903.) 8vo.

Boodle, Leonard Alfred. See **Solereder, H.** 1908.

Borg, Väinö. Beiträge zur Kenntniss der Flora und Vegetation der finnischen Fjelde. (Alpinen und subalpinen Gebirge.) I. Helsingfors, 1904. 8vo.

R. Univ., Upsala.

Börgesen, Frederik C. E. An ecological and systematic account of the Caulerpas of the Danish West Indies. (K. D. Vidensk. Selsk. Skr. 7, iv.) Köbenhavn, 1907. 4to.

Author.

Bottomley, William Beecroft. Seed and soil inoculation for leguminous crops. London, 1907. 8vo.

Author.

Bourdillon, Thomas Fulton. The Forest Trees of Travancore. Trivandrum, 1908. 8vo.

Author.

Bower, Frederick Orpen. The origin of a land flora : a theory based upon the facts of alternation. London, 1908. 8vo.

Briquet, John. Labiées du Paraguay. See **Micheli, M.**

Britton, Nathaniel Lord. Lucien Marcus UNDERWOOD. (Columbia Univ. Quarterly, 1907.) [New York] (1907.) 8vo.

Author.

Britzelmayr, Max. Index zu M. BRITZELMAYR'S Hymenomyceten-Arbeiten. See **Hoehnel, F., Ritter von.**

Brotherus, Victor Ferdinand. Musci Voeltzkowiani. Ein Beitrag zur Kenntnis der Moosflora der ostafrikanischen Inseln. (VOELTZKOW, Reise in Ostafrika . . . 1903–05. Bd. iii.) Stuttgart, 1908. 4to.

Author.

Brown, Harold. See **Dunstan, W. R., & H. B.**

Buchenau, Franz. Flora der ostfriesischen Inseln (einschliesslich der Insel Wangeroog). Ed. 4. Leipzig, 1901. 8vo.

Buchenau, F. Die springenden Bohnen aus Mexiko. (Aus der Natur, i.) Stuttgart, 1905. La. 8vo.

W. Botting Hemsley.

Buetschli, Otto. Gummilösungen. Interessante Schaumstrukturen von Dextrin und (Sitzungsb. bayer. Akad. 1903.) München, 1903. 8vo.

Sir J. D. Hooker.

Buffham, Thomas Hughes. *Chantransia trifila*, a new marine Alga. (Journ. Quekett Micr. Club, 2, v.) (London, 1892.) 8vo.

A. D. Cotton.

Buffham, T. H. On the antheridia, etc., of some Florideae. (Journ. Quekett Micr. Club, 2, v.) (London, 1893.) 8vo.

A. D. Cotton.

Buffham, T. H. Notes on some Florideae. (Journ. Quekett Micr. Club, 2, vi.) London, 1896. 8vo.

A. D. Cotton.

Burdon, Edward Russell. Some critical observations on the European species of the genus *Chermes*. (Journ. Econ. Biol. ii.) [London] 1908. 8vo.

Author.

Buschan, Georg. Vorgeschichtliche Botanik der Cultur- und Nutzpflanzen der alten Welt auf Grund prähistorischer Funde. Breslau, 1895. 8vo.

Cairnes, D. D. Moose Mountain District of Southern Alberta [with list of Fossil Plants, by D. P. Penhallow, pp. 53–55.] (Geol. Surv. Canada.) Ottawa, 1907. 8vo.

Director, Geological Survey of Canada.

Cajander, A. K. Beiträge zur Kenntniss der Vegetationen der Alluvionen des nördlichen Eurasiens. I. Die alluvionen des unteren Lena-Thales. Helsingfors, 1903. 4to.

R. Univ., Upsala.

Cambridge, George, Duke of. Memoir of his private life. See **Sheppard, E.**

Campbell-Brown, J. On the agricultural chemistry of the Tea plantations of India. (Journ. Chem. Soc. 1875.) [London] (1875.) 8vo.

Canada. Further contributions to Canadian Biology, being studies from the Marine Biological Station of Canada, 1902–05. (Ann. Rep. Dep. of Marine and Fisheries, xxxix.) Ottawa, 1907. 8vo. [*Contains:* The Plankton of Eastern Nova Scotia Waters, by R. Ramsay WRIGHT; The Diatomaceæ of Canso Harbour, Nova Scotia, by A. H. MACKAY; Report on the flora of Canso, by J. FOWLER; The Sea Weeds of Canso, by C. B. ROBINSON, etc.]
C. B. Robinson.

Canada. Canada's fertile northland. See **Chambers, E. J.**

Canada. Department of the Interior. Atlas of Canada. See **Atlases.**

Candolle, Augustin de. Biologie des capsules monospermes. (Arch. Sc. Genève, 4, xxv.) Genève, 1908. 8vo.
Author.

Cartwright, H. A. See **Wright, A., & H. A. C.**

Cash, J. Theodore. On the physiological action of the seeds of *Garcia nutans*, *Omphalea megacarpa* and *O. triandra* from Trinidad. (Journ. Physiol. xxxvi.) (Cambridge, 1908.) 8vo.
Author.

Castillo, L., & J. Dey. Jeografia vejetal del Rio Valdivia i sus inmediaciones. Ed. 2. Santiago de Chile, 1908. 8vo.
Authors.

Celi, Giuseppe. Ricerche sulla biologia e filogenesi del fico ed inquadramento delle relative razze italiane meridionali (*Ficus carica* L.) (Atti R. Ist. Incoragg. Napoli, 6, iv.) Napoli, 1908. 8vo.
Author.

Census catalogue of British Mosses. See **Moss Exchange Club.** 1907.

Ceylon. Royal Botanic Gardens. See **Ramaley, F.** 1908.

Chambers, Ernest J. Canada's fertile northland. A glimpse of the enormous resources of part of the unexplored regions of the Dominion, ed. by E. J. C. Ottawa, 1907. 8vo. With maps.
Minister of the Interior, Canada.

Chenon, Leonhard Johan. *Resp.* Nova plantarum genera. See **Linné, C. von.** 1751.

Chevalier, Auguste. Les végétaux utiles de l'Afrique tropicale française. Fasc. 3. Recherches sur les bois de différentes espèces de Légumineuses africaines, par Em. PERROT et G. GÉRARD. Paris, 1907. 8vo.—Fasc. 4. Le Cacaoyer dans l' Ouest africain, par Aug. CHEVALIER. Ib., 1908. 8vo.
Aug. Chevalier.

Chisholm, George G. The Times Gazetteer of the World. Re-issue. London, 1899. La. 8vo.

Christ, Hermann. Die Rosen der Schweiz mit Berücksichtigung der umliegenden Gebiete Mittel- und Süd-Europa's. Ein monographischer Versuch. Basel, Genf & Lyon, 1873. 8vo.

Christ, H. La flore de la Suisse et ses origines. Ed. française traduite par E. TIÈCHE. Nouv. éd., etc. Bale, Genève & Lyon, 1907. 8vo.

Sir Frank Crisp.

Chun, Carl. See **"Valdivia."**

Church, Arthur Herbert. The Royal Society. Some account of the 'Letters and Papers' of the period 1741–1806 in the Archives, with an index of authors. Oxford, 1908. 8vo.

Author.

Church, Arthur Harry. Types of floral mechanism : a selection of diagrams and descriptions of common flowers, etc. Pt. 1. Oxford, 1908. 4to.

Cockayne, L. New Zealand plants : their story. (Reprinted from the Lyttelton Times, May, 1906, and pasted down in a sm. 4to. volume.)

Sir J. D. Hooker.

Cockayne, L. Report on a botanical survey of the Waipoua Kauri Forest. (Dep. of Lands, New Zealand.) Wellington, 1908. fol.

Author.

Cockayne, L. Report on a botanical survey of the Tongariro National Park. (Dep. of Lands, New Zealand.) Wellington, 1908. fol.

Author.

Cockerell, Theodore Dru Alison. The fossil flora of Florissant, Colorado. (Bull. Amer. Mus. Nat. Hist. xxiv.) New York, 1908. 8vo.

Author.

Coelln, Johannes von. *Resp.* Diss. sistens specifica canadensium. See **Linné, C. von.** 1756.

Cogniaux, Alfred, & Élie Marchal. Les plantes ornamentales à feuillage panaché et coloré. Ouvrage édité par A. DALLIÈRE. i. (All issued.) Gand, 1873. Obl. 4to.

Bentham Trustees.

Cole, Rex Vicat. British Trees, drawn and described by R. V. C. Text revised by Dorothy KEMPE. London, 1907. 2 vols. 4to.

Colnaghi, Sir Dominic Ellis. See **Birdwood, Sir G. C. M.**

Comes, Orazio. Prospetto delle razze di tabacchi. (La R. Scuola Sup. di Agric. Portici nel passato e nel presente.) [Portici, 1906.] 4to.

Author.

Comes, O. Sulla varietà tipiche della *Nicotiana Tabacum*, L. (Boll. Tecnico, 1908, n. 1.) Scafati, 1908. 8vo.

Author.

Conder, Josiah. The flowers of Japan and the art of floral arrangement. Tokio, 1892. 4to.

Conwentz, Hugo Wilhelm. Beiträge zur Naturdenkmalpflege, herausg. von H. W. C. Heft 2. Berlin, 1908. 8vo.

Author.

Correns, Carl. Die Bestimmung und Vererbung des Geschlechtes nach neuen Versuchen mit höheren Pflanzen. Berlin, 1907. 8vo.

Courtet H. See **Chevalier, A.** § 2.

Cousins, Herbert Henry. See **Jamaica.** Board of Agriculture. § 3.

Cramer, P. J. S. Kritische Uebersicht der bekannten Fälle von Knospenvariation. (Natuurkund. Verh. Hollandsche Maatschappij Wetenschap. Derde Verzameling, vi. 3e Stuk.) Haarlem, 1907. 4to.

Dutch Soc. Sc. Haarlem.

Cratevas. See **Wellmann, M.** KRATEUAS. 1897.

Cunningham, David Douglas. Some Indian friends and acquaintances: a study of the ways of birds and other animals frequenting Indian streets and gardens. London, 1903. 8vo.

Cunningham, D. D. Plagues and pleasures of life in Bengal. London, 1907. 8vo.

Dalla Torre, C. G. von, & Hermann Harms. Genera Siphonogamarum ad Systema Englerianum conscripta. Fasc. 1 [–11.] Lipsiae, 1900–07. 4to.

Dalla Torre, C. G. von & H. Harms. Register zu de DALLA TORRE et HARMS Genera Siphonogamarum, etc. Leipzig, 1908. Narrow 4to.

Dallière, Alexis. See **Cogniaux, A., & É. Marchal.**

Dallimore, William. Holly, Yew and Box, with notes on other evergreens. London, 1908. 8vo.

Author.

Darelius, Johan Anders. *Resp.* Lignum colubrinum leviter delineatum. See **Linné, C. von.** 1749.

Darrah, Henry Zouch. Note on Cotton in Assam. Shillong, 1887. 8vo.

Dassow, Carl Magnus. *Resp.* Nova plantarum genera. See **Linné, C. von.** 1747.

Dawe, Morley Thomas. See **Uganda.**

Degen, Árpád von. See **Janchen, E., & B. Watzl.**

Dekker, J. De Looistoffen. Botanisch-chemische Monographie der Tanniden. i–ii. (Bull. Kol. Mus. Haarlem, n. 35 & 39.) Amsterdam, 1906 & 1908. 8vo.
Director, Koloniaal Museum, Haarlem.

De Wildeman, Émile. Notices sur des plantes utiles ou intéressantes de la flore du Congo, ii. Fasc. 1–2. Bruxelles, 1906–08. 8vo.
Secrétaire Général du Département des Finances de l' État Indépendant du Congo.

Dey, J. See **Castillo, L. & J. D.**

Dicksons & Co., *of Edinburgh.* A catalogue of hot-house, green-house, and hardy plants . . . alphabetically arranged according to the Linnean system. Edinburgh, 1792. 8vo.

Dictionaries of Languages:—Latin. See **Littleton, A.**

Diels, Hermann. Die Handschriften der antiken Ärtze. Teil 1 [-2.] (Abhandl. K. Preuss. Akad. 1905–06.) Berlin, 1905–06. 4to.

Dioscorides, Pedanios. See **Wellmann, M.**

Dioscorides, P. See **Bonnet, E.** Essai d'identification des plantes médicinales mentionnées par DIOSCORIDE.

Dodoens, Rembert. Histoire des plantes en laquelle est contenue la description entière des herbes, etc. Nouvellement traduite de bas aleman en françois par Charles de L' ESCLUSE. Anvers, 1557. fol.
Bentham Trustees.

Domin, Karl. Monographie der Gattung *Didiscus* (DC.) (Sitzungsb. K. böhm. Ges. Wiss. 1908.) Prag, 1908. 8vo.
Author.

Druce, George Claridge. List of British Plants containing the Spermophytes, Pteridophytes and Charads, etc. Oxford, 1908. 8vo.
Delegates of the Press, Oxford.

Dunstan, Wyndham Rowland, & Harold Brown. Occurrence of Hyoscyamine in the *Hyoscyamus muticus* of India. (Trans. Chem. Soc. 1899.) [London] (1899.) 8vo.

Dunstan, W. R., & Thomas Anderson Henry. The volatile constituents of the wood of *Goupia tomentosa.* (Trans. Chem. Soc. 1898.) [London] (1898.) 8vo.

Dunstan, W. R., & T. A. Henry. A chemical investigation of the constituents of Indian and American *Podophyllum* (*P. Emodi* and *P. peltatum.*) (Trans. Chem. Soc. 1898.) [London] (1898.) 8vo.

Dusén, Per. Ueber die tertiäre Flora der Seymour-Insel. (Wiss. Ergebn. Schwed. Südpolar-Exped. 1901–03, iii.) Stockholm, 1908. 4to.

Author.

Dyer, Sir William Turner Thiselton-. See **Bean, W. J.**

Ebert, Felix. Beiträge zur Kenntnis des chinesischen Arzneischatzes. Früchte und Samen. Diss. Zürich, 1907. 8vo.

H. Schinz.

Edinburgh. Royal Botanic Garden. List of Seeds collected during 1888 [–98, 1903–06]. Glasgow & Edinburgh (1888)–1906. 8vo. [The Lists of 1900, 1901 and 1902 are included in Notes from the R.B.G. Edinburgh, vols. i–iii.]

Regius Keeper.

Edinburgh. History of the Royal Botanic Garden, Edinburgh. (Notes R.B.G. Edinb. iii.) [Edinburgh] (1904–08.) 8vo.

Regius Keeper.

Edwards, Arthur Mead. Bacillaria. What are they? (Mém. Soc. Sc. Nat. Cherb. xxxvi.) [Cherbourg, 1908.] 8vo.

Sir J. D. Hooker.

Ekstam, Otto. Einige blutenbiologische Beobachtungen auf Spitzbergen. (Tromsö Museums Aarshefter 20.) Tromsö, 1898. 8vo.

R. Univ., Upsala.

Elfstrand, Mårten. Ueber die Pflanzenfamilie der Solanaceen vom pharmakologischen Gesichtspunkte aus. (Farmaceutisk Tidskr. 1897.) Stockholm, 1897. 8vo.

R. Univ., Upsala.

Elmer, A. D. E. See **Leaflets of Philippine Botany.** § 3.

Elmgren, Gabriel. *Resp.* Plantarum jamaicensium pugillus. See **Linné, C. von.** 1759.

Elmgren, Johan. *Resp.* Termini botanici. See **Linné, C. von.** 1762.

Elmquist, Carl Fredrik. Om de Skandinaviska Lycopodiaceerna. Akad Afhandl. Stockholm, 1869. 8vo.

R. Univ., Upsala.

Engelhardt, Hermann, & Kinkelin, F. I. Oberpliocäne Flora und Fauna des Untermaintales, insbesondere des Frankfurter Klärbeckens. —II. Unterdiluviale Flora von Hainstadt a. M. (Abhandl. Senckenb. Naturforsch. Ges. xxix.) Frankfurt a. M., 1908. 4to.

F. Kinkelin.

Engler, Adolf. Pflanzengeographische Gliederung von Afrika. (Sitzb. Preuss. Akad. 1908.) (Berlin, 1908.) 4to.

Author.

Engler, A. Additamentum ad Araceas-Pothoideas. (Engler, Das Pflanzenreich, iv. 23 B.) Leipzig, 1908. 8vo.

Engler, A. Die Pflanzenwelt Afrikas. See **Engler, A., & O. Drude.** Die Vegetation der Erde, ix.

Engler, A., & Oscar Drude. Die Vegetation der Erde. ix. Die Pflanzenwelt Afrikas, etc., von A. ENGLER. Band ii. Leipzig, 1908. 8vo. —— x. Grundzüge der Pflanzenverbreitung in den Karpathen, von F. PAX. Band ii. Leipzig, 1908. 8vo.

Engler, A., & K. Krause. Araceae-Monsteroideae. (Engler, Das Pflanzenreich, iv. 23 B.) Leipzig, 1908. 8vo.

Eriksson, Jakob. Om meristemet i dikotyla växters rötter. Akad. Afhandl. (Lunds Univ. Arsskr. xiii.) Lund, 1877. 4to.

R. Univ., Upsala.

Ernst, Alfred. Die neue Flora der Vulkaninsel Krakatau. (Vierteljahrsschr. Naturf. Ges. Zürich, lii.) Zürich, 1907. 8vo.

Essary, Samuel H. See **Bain, S. M., & S. H. E.**

Evans, G. Varieties of Wheat grown in the Central Provinces and Berar. (Dep. Agric. Centr. Prov. & Berar.) (Nagpur) 1908. 8vo.

Author.

Ewart, Alfred James. The movements of the soluble constituents in fine alluvial soil. (Proc. Chem. Indust. Victoria, 1907.) [Melbourne] (1907.) 8vo.

Author.

Falck, Johan Pehr. *Resp.* Planta *Alströmeria.* See **Linné, C. von.** 1762.

Falk, Otto Martin. Beskrifning öfver Skandinaviens Musci Cleistocarpi. Akad. Afhandl. Stockholm, 1869. 8vo.

R. Univ., Upsala.

Fawcett, Charles Gordon Hill. A monograph of Dyes and Dyeing in the Bombay Presidency. (Bombay) 1896. fol.

Federated Malay States. Government Gardens and Plantations. Administration, economic plants, etc. Correspondence, reports, etc. 1882–1905. fol.

Feltgen, Johann. Ascomycetenformen. See **Hoehnel, F., Ritter von.** 1906.

Fernald, Merritt Lyndon. See **Gray, A.** New Manual of Botany, ed. 7.

Fischer, Louis. Flora von Bern. Ed. 7. Bern, 1903. 8vo.

Fitch, Walter Hood, & Worthington George Smith. Illustrations of the British Flora. Ed. 7. London, 1908. 8vo.

Flahault, Charles. See **Vilmorin, Ph. L. de.** 1906.

Flett, John S. See **Anderson, Tempest.**

Flinck, Johan August. Om den anatomiska byggnaden hos de vegetativa organen för upplagsnäring. Akad. Afhandl. Helsingfors, 1891. 8vo.

R. Univ., Upsala.

Fornander, Andreas N. *Resp.* Herbationes upsalienses. See **Linné, C. von.** 1753.

Foslie, M. Ueber die Laminarien Norwegens. (Christiania Vidensk.-Selsk. Forhandl. 1884.) Christiania, 1884. 8vo.

Foster, William. The English Factories in India, 1622–1623. Oxford, 1908. 8vo.

Secretary of State for India.

Fowler, James. Report on the flora of Canso, Nova Scotia. See **Canada.**

Francis, Edward Belcham. Monograph on Cotton manufacture in the Punjab. Lahore, 1885. fol.

Franz, Johann Georg Friedrich. Diss. . . . de *Asparago* ex scriptis medicorum veterum. Lipsiae, 1778. 4to.

Fries, Robert. See **Fristedt, R., & R. Fries.**

Fristedt, Robert, & Robert Fries. Om tvänne i Sverige hittills misskända arter af växtslägtet *Rumex.* (Upsala Univ. Årsskr. 1861.) [Upsala, 1861.] 8vo.

R. Univ., Upsala.

Fritsch, Felix Eugen. See **Solereder, H.** 1908.

Gabrieli, Salvatore. Il mandorlo amaro considerato sotto l'aspetto filogenetico, culturale e chimico. (Atti R. Ist. Incoragg. Napoli, 6, iv.) Napoli, 1907. 8vo.

Author.

Gahn, Nils. *Resp.* Diss. . . . exhibens plantas officinales. See **Linné, C. von.** 1753.

Gandoger, Michel. Flore lyonnaise et des départements du sud-est, etc. Paris & Lyon, 1875. 12mo.

Gardiner, Walter, & Arthur William Hill. The histology of the endosperm during germination in *Tamus communis* and *Galium tricorne*. (Proc. Camb. Phil. Soc. xi.) (Cambridge, 1902.) 8vo.

A. W. Hill.

Gavazzi, Ing Piero. See **Birdwood, Sir G. C. M.**

Gayer, Karl. See **Schlich, W.** Manual of Forestry, v.

Gazetteers. See **Chisholm, G. G.,** The Times Gazetteer of the World; **India** (*general*), Imperial Gazetteer of India.

Gee, Walter Herbert. Monograph on fibrous manufactures in the Punjab. Lahore, 1891. Fol.

Geerligs, H. C. Prinsen. See **Java.** Proefstations voor Suikerriet in West-en Oost-Java. Handboek ten dienste van de Suikerriet-Cultuur. Derde deel. § 3.

Geographical Index (Extra-European) to books, periodicals, etc., compiled in the Intelligence Division [Topographical Section, General Staff], War Office, by Alexander KNOX, 1895 [-1906.] London (1896–1907.) 8vo.

Director of Military Operations, War Office.

Gertz, Otto. Studier öfver Anthocyan. Akad. Afhandl. Lund, 1906. 8vo.

R. Univ., Upsala.

Giglioli, Italo. La Canfora italiana. Ricerche analitiche comparative sulla produttività in Canfora, etc. del fogliame dei "*Laurus Camphora*" . . . vegetanti in varie parti d' Italia, etc. (Atti del vi. Congr. Internaz. Chim. Applic., Roma, 1906.) Roma, 1908. 8vo.

Author.

Girard, Jules. Les plantes étudiées au microscope. (Bibliothèque des Merveilles). Paris, 1873. 8vo.

W. Botting Hemsley.

Goebel, Karl. Einleitung in die experimentelle Morphologie der Pflanzen. Leipzig and Berlin, 1908. 8vo.

Goethe, Johann Wolfgang von. GOETHE as a Naturalist. See **Treutler, W. J.**

Goldney, Samuel. Kew Gardens. A popular guide and souvenir (for 1907.) Ed. 2. London, 1907. Obl. 8vo.

Director, R. B. G., Kew.

Gómez, Emilio Ribera. See **Ribera Gómez, E.**

Gordon, W. J. Manual of British Grasses, with a coloured illustration of every species, etc. London [1907.] 8vo.

Gråberg, Johan Mårten. *Resp.* Fundamentum fructificationis. See **Linné, C. von.** 1762.

Graham, R. J. D. On the histology of the Ephedreae, with special reference to the value of histology for systematic purposes. (Trans. R. Soc. Edinb. xlvi.) Edinburgh, 1908. 4to.

Author.

Gray, Asa. GRAY'S New Manual of Botany. Ed. 7 . . . rearranged and extensively revised by B. L. ROBINSON and M. L. FERNALD. New York, (1908.) 8vo.

B. L. Robinson.

Grufberg, Isaac Olai. *Resp.* Flora anglica. See **Linné, C. von.** 1754.

Guiana. British Guiana and its resources. See **Harrison, J. B.**

Haarlem. Koloniaal Museum. Catalogus der boekverzameling. Nieuwe uitgave. Haarlem, 1908. 8vo.

Director.

Haarlem. Koloniaal Museum. Gids voor de bezoekers van het Koloniaal Museum te Haarlem. Haarlem, 1908. 8vo.

Director.

Haartman, Johan J. *Resp.* Plantae hybridae. See **Linné, C. von.** 1751.

Haberlandt, Gottlieb. Ueber die Beziehungen zwischen Function und Lage des Zellkernes bei den Pflanzen. Jena, 1887. 8vo.

Haddington, Thomas, *6th Earl.* See **Hamilton, T.**

Halácsy, Eugen von. Conspectus florae Graecae. Lipsiae, 1900-04. 3 vols. 8vo. —— Supplementum. Ib., 1908. 8vo.

Halenius, Jonas P. *Resp.* Plantae rariores camschatcenses. See **Linné, C. von.** 1750.

Hall, Alfred Daniel. The book of the Rothamsted experiments. London, 1905. 8vo.

Hall, Harvey Monroe. Compositae of Southern California. (Univ. Calif. Publ. Bot. iii. n. 1.) Berkeley, 1907. 8vo.

Author.

Hall, H. M. Nomenclature of the Wild Sages [*Salvia.*] (Pacific Rural Press, lxxv.) [San Francisco, 1908.] 8vo. (mounted.)

Author,

Hallenberg, Georg. *Resp.* De *Dulcamara.* See **Linné, C. von.** 1771.

Hallman, Johan Gustaf. *Resp.* De *Passiflora.* See **Linné, C. von.** 1745.

Hamet, Raymond. Monographie du genre *Kalanchoe.* (Bull. Herb. Boiss. 2, vii–viii.) Genève (1907–8.) 8vo.

Author.

Hamilton, Thomas, *6th Earl of Haddington.* A short treatise on forest-trees, aquaticks, evergreens, fences and grass-seeds. Edinburgh, 1765. 12mo.

Hammarsten, Olof. Om de ätliga svamparnas näringsvärde. (Upsala Läkareförenings Förhandl. xxii.) Upsala, 1887. 8vo.

R. Univ., Upsala.

Hanausek, Thomas Franz. The microscopy of technical products. Revised by the author and translated by A. L. WINTON with the collaboration of Kate G. BARBER. New York, 1907. 8vo.

Hanbury, Frederick Janson. The London Catalogue of British Plants. Ed. 10. London, 1908. 8vo.

Hariot, Paul. Liste des algues marines rapportées de Yokoska (Japon) par M. le Dr. SAVATIER. (Mém. Soc. Sc. Cherb. xxvii.) (Cherbourg, 1891.) 8vo.

A. D. Cotton.

Hariot P. Algues [de l'Expédition antarctique française, 1903–05.] Paris (1907.) 4to.

A. D. Cotton.

Harman, F. E. Report on Coffee Leaf Disease (*Hemileia vastatrix.*) Bangalore, 1880. 4to.

Harms, Hermann. See **Dalla Torre, C. G. von., & H. H.**

Harper, Robert Almer. The organization of certain coenobic plants. (Bull. Univ. Wisconsin. Sc. Ser. iii.) Madison, 1908. 8vo.

Author.

Harrison, J. B. British Guiana and its resources. London, 1907. 8vo.

Author.

Hart, John Hinchley. Herbarium list, Botanical Department, Trinidad. [Trinidad Flora.] Compiled and edited by J. H. H. Port-of-Spain, Trinidad, 1908. 8vo.

Author.

Hartig, Theodor. Vollständige Naturgeschichte der forstlichen Culturpflanzen Deutschlands. Berlin, 1851. 4to.

Hasselquist, Fredrik. *Resp.* Vires plantarum. See **Linné, C. von.** 1747.

Hayata, B. Flora montana Formosæ, etc. (Journ. Coll. Sc. Tōkyō, xxv.) Tōkyō, 1908. 4to.

Imperial Univ., Tōkyō.

Hedbom, Karl. Farmakodynamiska studier å det isolerade och öfverlefvande däggdjurshjärtat. (Upsala Univ. Årsskr., 1896.) Upsala, 1897. 8vo.

R. Univ., Upsala.

Hedenberg, Anders. *Resp.* Stationes plantarum. See **Linné, C. von.** 1754.

Hegardt, Cornelius. *Resp. Ficus.* See **Linné, C. von.** 1744.

Hehn, Victor. The wanderings of plants and animals from their first home, ed. by J. S. STALLYBRASS. London, 1885. 8vo.

Heinricher, Emil. *Potentilla aurea*, L. mit zygomorphen oder auch asymmetrischen Blüten und Vererbbarkeit dieser Eigentümlichkeit. (Zeitschr. des Ferdinandeums, 3. Fölge, 52. Heft.) [Wein, 1907.] 8vo.

Author.

Heinzerling, Otto. Der Bau der Diatomeenzelle, etc. See **Bibliotheca Botanica,** Heft 69. 1908.

Hellenius, Carl Nils. *Resp. Hypericum.* See **Linné, C. von.** 1776.

Henning, Ernst. Agronomiskt-växtfysiognomiska studier i Jemtland. Akad. Afhandl. Stockholm, 1889. 4to.

R. Univ., Upsala.

Henry, Thomas Anderson. See **Dunstan, W. R., & T. A. H.**

Henry, Yves. Le caoutchouc dans l'Afrique occidentale française. See **Africa.** Afrique occidentale française.

Henry, Y. Campagne cotonnière de 1906. See **Africa.** Afrique occidentale française.

Henry, Y. Le Coton dans l'Afrique occidentale française See **Africa.** Afrique occidentale française.

Hertwig, Richard. Ueber Wesen und Bedeutung der Befruchtung. (Sitzungsb. bayer. Akad. 1902.) München, 1902. 8vo.

Sir J. D Hooker.

Hesselgren, Nils N. *Resp.* Pan svecicus. See **Linné, C. von** 1749.

Hetschko, Alfred. Ueber den Insektenbesuch bei einigen *Vicia*-Arten mit extrafloralen Nektarien. (Wien. Entom. Zeit. xxvii.) [Wien] (1908.) 8vo.

Author.

Hill, Arthur William. Some High Andine and Antarctic Umbelliferae. (Proc. Camb. Phil. Soc. xii.) (Cambridge, 1904.) 8vo.

Author.

Hill, A. W. Note on some peculiar features in seedlings of *Peperomia*. (Proc. Camb. Phil. Soc. xiii.) (Cambridge) [1905 ?] 8vo.

Author.

Hill, A. W. See **Gardiner, W., & A. W. H.**

Himpel, J. St. Flora von Elsass-Lothringen. Ed. 2. Strassburg [s.a.] 8vo.

Hiorth, Johan. *Resp.* Plantae esculentae patriae. See **Linné, C. von.** 1752.

Hirn, Karl Engelbrecht. Beiträge zur Kenntnis der Oedogoniaceen (Reprinted, with slight alterations, from Acta Soc. Sc. Fenn. xxvii.) Helsingfors, 1900. 4to.

R. Univ., Upsala.

Hjort, Johan. Some results of the International Ocean Research. (Translated from Saertryk af Aarsberetning Vedk. Norges Fiskerier, 2 Hefte, 1907.) Edinburgh, 1908. 8vo.

Director, Scottish Oceanographical Laboratory.

Hoehnel, Franz, Ritter von. Index zu M. Britzelmayr's Hymenomyceten-Arbeiten. [Wien, s.a.] 8vo.

Author.

Hoehnel, F., Ritter von. Fragmente zur Mykologie. [i–iv.] (Sitzungsb. Akad. Wien, cxi-cxvi.) Wien, 1902–07. 8vo.

Author.

Hoehnel, F., Ritter von. Revision von 292 der von J. Feltgen aufgestellten Ascomycetenformen auf Grund der Originalexemplare. (Sitzungsb. Akad. Wien, cxv.) Wien, 1906. 8vo.

Author.

Hoehnel, F., Ritter von, & Viktor Litschauer. Beiträge zur Kenntnis der Corticieen. [i–ii.] (Sitzungsb. Akad. Wien, cxv–cxvi.) Wien, 1906–07. 8vo.

Franz, Ritter von Hoehnel.

Hoejer, Johan Christian. *Resp.* Demonstrationes plantarum. See **Linné, C. von.** 1753.

Holder, Edwin. Monograph on Dyes and Dyeing in the Madras Presidency. Madras, 1896. fol.

Holmes, Edward Morell. Catalogue of the medicinal plants in the Museum of the Pharmaceutical Society of Great Britain. London, 1896. 8vo.

O. Stapf.

Hooker, Sir Joseph Dalton. A sketch of the flora of British India. (Imperial Gazetteer of India, ed. 3, i.) Oxford, 1906. 8vo.

Author.

Hooker, Sir William Jackson. Diplomas granted to Sir. W. J. Hooker, with correspondence relating thereto. fol.

Sir J. D. Hooker.

Hopkirk, Thomas. Flora glottiana. A catalogue of the indigenous plants on the banks of the River Clyde, etc. Glasgow, 1813. 8vo. [Second copy containing a sketch of HOPKIRK'S villa at Helensburgh, by William Dawson HOOKER.]

Hosséus, C. C. Aus den Kautschukgebieten von Bahia und Piauhy (Gummi-Zeitung, 1908). [Berlin] (1908.) 8vo.

Huettig, O. Geschichte des Gartenbaues. Berlin, 1879. 8vo.

W. Botting Hemsley.

Hult, R. Recherches sur les phénomènes périodiques des plantes. (Ymer, 1881.) (Stockholm, 1881.) 8vo.

R. Univ., Upsala.

Ḥusain Ibn 'Abd Allāh (Abū 'Alī), *called* Ibn Sīnā or Avicenna. AVICENNAE arabum medicorum principis canon medicinæ, ex GERARDI Cremonensis versione, & Andreae ALPAGI Bellunensis castigatione, a Joanne COSTAEO & Joanne Paulo MONGIO annotationibus iampridem illustratus, etc. Venetiis apud JUNTAS, 1595 2 vols. fol.

Bentham Trustees.

Ibn Sīnā or Avicenna. See **Ḥusain Ibn 'Abd Allāh.**

Icones plantarum centrali-americanarum. [46 plates from the 'Botanical Gazette' and SARGENT'S 'Trees and Shrubs,' of new plants, chiefly described by J. Donnell SMITH.]

Ihering, Hermann von. Archhelenis und Archinotis. Gesammelte Beiträge zur Geschichte der neotropischen Region. Leipzig, 1897. 8vo.

India (*general*). The Imperial Gazetteer of India. New ed. Vols. ii. v–xxiv. Oxford, 1908. 8vo.

. *Secretary of State for India.*

India (*general*). A manual of Forest Law, compiled for the use of students at the Imperial Forest College, Dehra Dún, 1906. Calcutta, 1906. 8vo.

Inspector General of Forests to the Government of India.

India (*general*). A concise manual of Sylviculture for the use of forestry students in India. Calcutta, 1906. 8vo.
Inspector General of Forests to the Government of India.

India (*general*). Indian forest utilization. See **Troup, R. S.**

India (*special*). Bengal. Report on the cultivation of Sugar by Indigo planters in Bihar (with appendices). Calcutta, 1901. fol.

India (*special*). Burma. Report on the Sugarcane-growing lands of the Beelin Township, Shwaygin District. (Rangoon, 1883.) fol.

India (*special*). Central Provinces. Review . . . on Arboricultural Operations, 1871–72 and 1872-73. Nagpur, 1874. fol.

India (*special*). Central Provinces and Berar. Varieties of Wheat. See **Evans, G.** 1908.

India (*special*). North Western Provinces and Oudh. Reports on the Arboricultural Operations, 1893–1900. Allahabad, 1893–1900. fol.

India (*special*). North Western Provinces and Oudh. Department of Land Records and Agriculture. Reports on the Operations, 1892–1900. Allahabad, 1893–1901. fol.

India (*special*). Punjab. Maize in the Punjab. (Selections from the Records of the Office of the Financ. Comm., Punjab. N.S. n. 10.) Lahore, 1887. fol.

India (*special*). Punjab. Papers relating to Sugar cultivation in the Punjab. (Lahore, 1883.) fol.

Ingham, William. A census catalogue of British Mosses. See **Moss Exchange Club.** 1907.

Jaeggli, Mario. Monografia floristica del Monte Camoghè (presso Bellinzona). Diss. (Boll. Soc. ticinese Sc. Nat. iv.; Mitteil. Bot. Mus. Univ. Zürich, xxxvii.) Bellinzona, 1908. 8vo.
H. Schinz.

Jamieson, Thomas. [Report on the utilisation of nitrogen in the air by plants.] See Aberdeen. Agric. Research Assoc. Report, 1905.

Janchen, Erwin. Die europäischen Gattungen der Farn- und Blütenpflanzen nach dem wettsteinschen System geordnet von E. J. Wien, 1908. 8vo.
Author.

Janchen, E. & B. Watzl. Ein Beitrag zur Kenntnis der Flora der dinarischen Alpen. Unter Mitwirkung von A. von DEGEN. (Öesterreich. Bot. Zeitschr. 1908.) Wein, 1908. 8vo.
E. Janchen.

Janczewski, Ritter von Glinka, Eduard. Monographie des Groseilliers *Ribes*, L. (Mém. Soc. Phys. Gen. xxxv.) Genève, 1907. 4to.

Jerlin, Pehr. *Resp.* Macellum olitorium. See **Linné, C. von.** 1760.

Joerlin, Engelbert. *Resp.* Plantæ tinctoriæ. See **Linné, C. von.** 1759.

Johnston, Sir Harry Hamilton. Report of the first three years' administration of the eastern portion of British Central Africa. London, 1894. fol.

Jones, Marcus E. Contributions to Western Botany, n. 8, 10, 11, 12. Robinson, Utah, 1898–1908. 8vo. [N. 1–6 and 9 are in Zoe, ii.–v., and n. 7 in Proc. Calif. Acad. Sc. 2, v.]

Jones, M. E. The Willow family of the Great Plateau. Salt Sake, Utah, 1908. 8vo.

Jongkindt Coninck, A. M. C. Dictionnaire Latin-Grec-Français-Anglais-Allemand-Hollandais des principaux termes employés en botanique et en horticulture, etc. Ed. 2. Bussum, 1907. 8vo.

Julius, G. A. Western Australian Timber Tests, etc. See **Australia.** Western Australia.

Jumelle, Henri. Le *Plectaneia elastica* et le *Mascarenhasia lisianthiflora* dans le sud-ouest de Madagascar. (Le Caoutch. & La Gutta-Percha, 1908.) (Paris, 1908.) 8vo.

Author.

Jumelle, H., & H. Perrier de la Bathie. Une nouvelle plante à Caoutchouc de Madagascar [*Plectaneia elastica.*] (Le Caoutch. & La Gutta-Percha, 1908.) Paris, 1908. 8vo.

Authors.

(Justice, James.) The Scots gardiners director . . . by a Gentleman, one of the members of the Royal Society. Ed. 2. Edinburgh, 1759. 8vo.

Karlsson, Gustaf Adolf. Transfusionsväfnaden hos Conifererna. Akad. Afhandl. (Lunds Univ. Årsskr. xxiv.) Lund, 1888. 4to.

R. Univ., Upsala.

Karsten, Georg. Das Phytoplankton des antarktischen Meeres, etc., des atlantischen Oceans, und das indische Phytoplankton. See **"Valdivia."**

Kempe, Dorothy. See **Cole, R. V.**

Kemsey, W. The British herbal : or, a practical treatise on the uses and application of the common herbs of Great Britain, etc. Bristol, 1838. 12mo.

Kerner von Marilaun, Anton. Leben und Arbeit. See **Kronfeld, E. M.**

Kew. Royal Botanic Gardens. Index kewensis . . . Supplementum tertium nomina . . . ab initio anni 1901 ad finem anni 1905 complectens, ductu et consilio D. PRAIN confecerunt herbarii horti regii botanici kewensis curatores. Oxonii, 1908. 4 to.

Delegates of the Press, Oxford (7 copies).

Kew. Royal Botanic Gardens. See **Bean, W. J.**

Kew. Royal Botanic Gardens. See **Moncrieff, A. R. Hope, & T. Mower Martin.**

Kiernander, Jonas. *Resp.* Radix Senega. See **Linné, C. von.** 1749.

Kinkelin, F. See **Engelhardt, H., & F. K.**

Kinzel, Wilhelm. Indischer Rübkuchen oder Rapskuchen? (Fühlings Landwirtschaftl. Zeit. lvii.) (Stuttgart) [1908?] 8vo.

Author.

Kirchmayr, Heinrich. Die extrafloralen Nektarien von *Melampyrum* vom physiologisch-anatomischen Standpunkt. (Sitzungsb. Akad. Wien, cxvii.) Wein, 1908. 8vo.

Author.

Kjellman, Frans Reinhold. Bidrag till kännedomen om Skandinaviens Ectocarpeer och Tilopterider. Akad. Afhandl. Stockholm, 1872. 8vo

R. Univ., Upsala.

Kjellman, F. R. Om tschuktschernas hushållsväxter. (Ymer, 1882.) [Stockholm] (1882.) 8vo.

R. Univ., Upsala.

Kjellman, F. R. Om japansk trädgårdskonst. (Svenska Trädgårdsföreningens Tidskr. 1882.)

R. Univ., Upsala.

Kjellman, F. R. Fanerogamfloran på S:t Lawrence-ön. (Vega-Exped. Vetenskapl. Iakttagelser, ii.) Stockholm, 1883. 8vo.

R. Univ., Upsala.

Kjellman, F. R. Fanerogamer från Vest-Eskimåernas Land bestämda af F. R. K. (Vega-Exped. Vetenskapl. Iakttagelser, ii.) Stockholm, 1883. 8vo.

R. Univ., Upsala.

Kjellman, F. R. Om Kommandirski-Öarnas Fanerogamflora. (Vega-Exped. Vetenskapl. Iakttagelser, iv.) Stockholm, 1885. 8vo.

R. Univ., Upsala.

Kjellman, F. R., & Axel Nikolaus Lundström. Fanerogamer från Novaja Semlja, Wajgatsch och Chabarova. (Vega-Exped. Vetenskapl. Iakttagelser, i.) Stockholm, 1882. 8vo.

R. Univ., Upsala.

Klase, Lars Magnus. *Resp. Betula nana.* See **Linné, C. von.** 1743.

Klincksieck, Paul, & Th. Valette. Code des couleurs à l'usage des naturalistes, artistes, commerçants et industriels ; 720 échantillons de couleurs classés, etc. Paris, 1908. 8vo.

Knox, Alexander. Notes on the Geology of the continent of Africa, with an introduction and bibliography. London, 1905. 8vo.

Director of Military Operations, War Office.

Knox, A. Rules for the transliteration of place-names occurring on foreign maps. London, 1906. Sm. 8vo.

Director of Military Operations, War Office.

Knox, A. See **Geographical Index.**

Koestler, Guido. Der Einfluss des Luftsauerstoffes auf die Gärtätigkeit typischer Milchsäurebakterien. Diss. Zurich, 1907. 8vo.

H. Schinz.

Kohl, Friedrich Georg. Ueber die Organisation und Physiologie der Cyanophyceenzelle und die mitotische Teilung ihres Kernes. Jena, 1903. 8vo.

Koorders, S. H., & Theodoric Valeton. Bijdrage n. 1 [— xi] tot de kennis der Boomsoorten van Java. Additamenta ad cognitionem florae javanicae. Arbores. (Mededeelingen 's Lands Plantentuin [Dep. Landbouw], Buitenzorg.) Batavia, 1894–1906. 8vo.

Director of Agriculture, Dutch E. Indies, & S. H. Koorders.

Krateuas. See **Wellmann, M.** 1897.

Kraus, Gregor. Geschichte der Pflanzeneinführungen in die europäischen botanischen Gärten. Leipzig, 1894. 8vo.

Krause, K. Araceae-Calloideae. (Engler, Das Pflanzenreich, iv. 23 B.) Leipzig, 1908. 8vo.

Krause, K. See **Engler, A., & K. K.** 1908.

Kronfeld, E. M. Anton KERNER von Marilaun. Leben und Arbeit eines deutschen Naturforschers. Mit einem Geleitwort von R. von Wettstein. Leipzig, 1908. 8vo.

Kuckuck, Paul. Bemerkungen zur marinen Algenvegetation von Helgoland. (Komm. wiss. Unters. deutsch. Meere, N. F., i.) [Kiel, 1894.] 4to.

Bentham Trustees.

Kuhn, Eduard. Über den Wechsel der Zelltypen im Endothecium der Angiospermen. Diss. Zürich, 1908. 8vo.

H. Schinz.

Laeken. Jardin colonial. Liste des végétaux cultivés. Bruxelles, 1908. 8vo.

Secrétaire Général du Département des Finances de l'État Indépendant du Congo.

Laestadius, Carl Petter. Bidrag till kännedomen om växtligheten i Torneå Lappmark. Diss. Upsala, 1860. 8vo.

R. Univ., Upsala.

Lakowitz, Conrad. Die Algenflora der Danziger Bucht. Ein Beitrag zur Kenntnis der Ostseeflora. Danzig, 1907. La. 8vo.

Author.

Lamb, Edmund. Climatological observations, taken at Borden Wood, in the Parish of Chithurst, County of Sussex, during the year 1904 [-07.] (Privately printed, 1905-08.) 4to.

Author.

Larter, C. E. Devon Mosses and Hepatics. (Trans. Devon. Assoc. Adv. Sc. xl.) [Plymouth] 1908. 8vo.

Author.

Laurén, Walter. Om inverkan af eterånga på groddplantors andning. Akad. Afhandl. Helsingfors, 1891. 8vo.

R. Univ., Upsala.

Laval, Patrik Fabian Honoré de. Framställning af chlorophyllkornens anatomiska egenskaper och utveckling enligt de nyaste åsigterna. Akad. Afhandl. Uppsala, 1872. 8vo.

R. Univ., Upsala.

Lee, James. An introduction to Botany, containing an explanation of the theory of that science; extracted from the works of Dr. LINNAEUS, etc. Ed. 4, corrected. London, 1788. 8vo.

Leitgeb, Hubert. Mittheilungen aus dem botanischen Institute zu Graz. See **Graz.** § 3.

[Lemström, Selim.] Om elektricitetens inflytande på växterna. Inbjudningsskrift. Helsingfors, 1890. Sm. 4to. —— II. Ib., 1901. Sm. 4to.

R. Univ., Upsala.

L'Escluse, *latinized* **Clusius, Jules Charles de.** See **Dodoens, R.** 1557.

Leslie, Thomas Nicholas. See **Seward, A. C., & T. N. L.**

Le Texnier. Notices sur les jardiniers célèbres et les amateurs de jardins. Le Jardin de la Malmaison. JOSÉPHINE, DELAHAYE et BONPLAND. (Moniteur d'Hort.) Paris, 1906. 8vo. —— Un protecteur du jardinage, Sir Joseph BANKS. Paris, 1907. 8vo.

Author.

Le Texnier. Essais sur l'histoire de quelques fleurs d'ornement. Le Chrysanthème. (Le Jardin, 1906.) Paris, 1906. 8vo. —— La Jacinthe. Ib., 1907. 8vo. —— La Tulipe. Ib., 1907. 8vo. —— L'Œillet. (Le Jardin, 1907–08.) Ib., 1908. 8vo.

Author.

Lewkowitsch, J. Ochoco fat [contained in the seeds of *Scyphocephalium ochocoa*, Warb.]. (Analyst, 1908.) [London] (1908.) 8vo.

Author.

Lindau, Gustav. Index nominum omnium . . . quae NYLANDERI synopsis Lichenum complectitur. Berlin, 1907. 8vo.

Lindau, G., & Paul Sydow. Thesaurus litteraturae mycologicae et lichenologicae, etc. i. Pars 1 [–2]. Lipsiis, 1907 → 8vo.

Lindroth, Johan Ivar. Die Umbelliferen-Uredineen. (Acta Soc. Fauna et Flora Fenn. xxii.) Helsingfors, 1902. 8vo.

R. Univ., Upsala.

Linné, Carl von. *Praeses.* Diss. de *Betula nana.* [*Resp.*] L. M. KLASE. Stockholmiæ, 1743. 4to.

R. Univ., Upsala.

Linné, C. von. *Praeses.* Disputat. . . . qua *Ficus* ejusque historia naturalis & medica exhibetur. [*Resp.*] C. HEGARDT. Upsaliæ, 1744. 4to.

R. Univ., Upsala.

Linné, C. von. *Praeses.* Diss. de Peloria. [*Resp.*] D. RUDBERG. Upsaliæ, 1744. 4to.

R. Univ., Upsala.

Linné, C. von. *Praeses.* Hortus upsaliensis. [*Resp.*] S. NAUCLÉR. Upsaliæ, 1745. 4to.

R. Univ., Upsala.

Linné, C. von. *Praeses.* Diss. de Anandria. [*Resp.*] E. Z. TURSÉN. Upsaliæ, 1745. 4to.

R. Univ., Upsala.

Linné, C. von. *Praeses.* Diss de *Passiflora.* [*Resp.*] J. G. HALLMAN. Holmiae, 1745. 4to.

R. Univ., Upsala.

Linné, C. von. *Praeses.* Diss. qua plantæ Martino-Burserianæ explicantur. [*Resp.*] R. MARTIN. Upsaliæ, 1745. 4to.

R. Univ., Upsala.

Linné, C. von. *Praeses.* Sponsalia plantarum. [*Resp.*] J. G. WAHLBOM. Stockholmiæ, 1746. 4to.

R. Univ., Upsala.

Linné, C. von. *Praeses.* Vires plantarum. [*Resp.*] F. HASSELQUIST. Upsaliæ, 1747. 4to.

R. Univ., Upsala.

Linné, C. von. *Praeses.* Nova plantarum genera. [*Resp.*] C. M. DASSOW. Holmiæ, 1747. 4to.

R. Univ., Upsala.

Linné, C. von. *Praeses.* Flora oeconomica. [*Resp.*] E. ASPELIN. Upsaliæ, 1748. 4to.

R. Univ., Upsala.

Linné, C. von. *Praeses.* Lignum colubrinum leviter delineatum. [*Resp.*] J. A. DARELIUS. Upsaliæ, 1749. 4to.

R. Univ., Upsala.

Linné, C. von. *Praeses.* Specimen academicum de oeconomia naturae. [*Resp.*] I. J. BIBERG. Upsaliæ, 1749. 4to.

R. Univ., Upsala.

Linné, C. von *Praeses.* Pan svecicus. [*Resp.*] N. L. HESSELGREN. Upsaliæ, 1749. 4to.

R. Univ., Upsala.

Linné, C. von. *Praeses.* Gemmæ arborum. [*Resp.*] P. LÖFLING. Upsaliæ, 1749. 4to.

R. Univ., Upsala.

Linné, C. von. *Praeses.* Radix Senega. [*Resp.*] J. KIERNANDER. Holmiæ, 1749. 4to.

R. Univ., Upsala.

Linné, C. von. *Praeses.* Diss. sistens *Splachnum.* [*Resp.*] L. MONTIN. Stockholmiæ, 1750. 4to.

R. Univ., Upsala.

Linné, C. von. *Praeses.* Semina Muscorum detecta. [*Resp.*] P. J. BERG. Upsaliæ, 1750. 4to.

R. Univ., Upsala.

Linné, C. von. *Praeses.* Plantæ rariores camschatcenses. [*Resp.*] J. P. HALENIUS. Upsaliæ, 1750. 4to.

R. Univ., Upsala.

Linné, C. von. *Praeses.* Diss. qua nova plantarum genera. [*Resp.*] L. J. CHENON. Upsaliæ, 1751. 4to.

R. Univ., Upsala.

Linné, C. von. *Praeses.* Plantæ hybridæ. [*Resp.*] J. J. HAARTMAN. Upsaliæ, 1751. 4to.

R. Univ., Upsala.

Linné, C. von. *Praeses.* Plantæ esculentæ patriæ. [*Resp.*] J. HIORTH. Upsaliæ, 1752. 4to.

R. Univ., Upsala.

Linné, C. von. *Praeses.* Specimen academicum, quo *Euphorbia* ejusque historia naturalis et medica exhibetur. [*Resp.*] J. WIMAN. Upsaliæ, 1752. 4to.

R. Univ., Upsala.

Linné, C. von. *Praeses.* Diss. sistens Rhabarbarum. [*Resp.*] S. ZIERVOGEL. Upsaliæ, 1752. 4to. *R. Univ., Upsala.*

Linné, C. von. *Praeses.* Diss . . . exhibens plantas officinales. [*Resp.*] N. GAHN. Upsaliæ, 1753. 4to.

R. Univ., Upsala.

Linné, C. von. *Praeses.* Demonstrationes plantarum in horto upsaliensi 1753. [*Resp.*] J. C. HOEJER. Upsaliæ, 1753. 4to.

R. Univ., Upsala.

Linné, C. von. *Praeses.* Herbationes upsalienses. [*Resp.*] A. N. FORNANDER. Upsaliæ, 1753. 4to.

R. Univ., Upsala.

Linné, C. von. *Praeses.* Vernatio arborum. [*Resp.*] H. BARCK. Upsaliæ, 1753. 4to.

R. Univ., Upsala.

Linné, C. von. *Praeses.* Diss. sistens stationes plantarum. [*Resp.*] A. HEDENBERG. Upsaliæ, 1754. 4to.

R. Univ., Upsala.

Linné, C. von. *Praeses.* Flora anglica . . . [*Resp.*] I. O. GRUFBERG. Upsaliæ, 1754. 4to.

R. Univ., Upsala.

Linné, C. von. *Praeses.* Diss. de horticultura academica. [*Resp.*] J. G. WOLLRATH. Upsaliæ, 1754. 4to.

R. Univ., Upsala.

Linné, C. von. *Praeses.* Diss. in qua fungus melitensis. [*Resp.*] J. PFEIFFER. Upsaliæ, 1755. 4to.

R. Univ., Upsala.

Linné, C. von. *Praeses.* Flora palæstina. [*Resp.*] B. J. STRAND. Upsaliæ, 1756. 4to.

R. Univ., Upsala.

Linné, C. von. *Praeses.* Flora alpina. [*Resp.*] N. N. AMANN. Upsaliæ, 1756. 4to.

R. Univ., Upsala.

Linné, C. von. *Praeses.* Calendarium floræ. [*Resp.*] A. M. BERGER. Upsaliæ, 1756. 4to.

R. Univ., Upsala.

Linné, C. von. *Praeses.* Diss. sistens specifica canadensium. [*Resp.*] J. von COELLN. Scarae, 1756. 4to.

R. Univ., Upsala.

Linné, C. von. *Praeses.* Frutetum svecicum. [*Resp.*] D. M. VIRGANDER. Upsaliæ, 1758. 4to.

R. Univ., Upsala.

Linné, C. von. *Praeses.* Auctores botanici. [*Resp.*] A. LOO. Upsaliæ, 1759. 4to.

R. Univ., Upsala.

Linné, C. von. *Praeses.* Plantæ tinctoriæ. [*Resp.*] E. JOERLIN. Upsaliæ, 1759. 4to.

R. Univ., Upsala.

Linné, C. von. *Praeses.* Flora capensis. [*Resp.*] C. H. WÄNNMAN. Upsaliæ, 1759. 4to.

R. Univ., Upsala.

Linné, C. von. *Praeses.* Arboretum svecicum. [*Resp.*] D. D. PONTIN. Upsaliæ, 1759. 4to.

R. Univ., Upsala.

Linné, C. von. *Praeses.* Plantarum jamaicensium pugillus. [*Resp.*] G. ELMGREN. Upsaliæ, 1759. 4to.

R. Univ., Upsala.

Linné, C. von. *Praeses.* Flora jamaicensis. [*Resp.*] C. G. SANDMARK. Upsaliæ, 1759. 4to.

R. Univ., Upsala.

Linné, C. von. *Praeses.* Macellum olitorium. [*Resp.*] P. JERLIN. Holmiæ, 1760. 4to.

R. Univ., Upsala.

Linné, C. von. *Praeses.* Prolepsis plantarum. [*Resp.*] H. ULLMARK. Upsaliæ, 1760. 4to.

R. Univ., Upsala.

Linné, C. von. *Praeses.* Plantæ rariores africanæ. [*Resp.*] J. PRINTZ. Holmiæ, 1760. 4to.

R. Univ., Upsala.

Linné, C. von. *Praeses.* Termini botanici. [*Resp.*] J. ELMGREN. Upsaliæ, 1762. 4to.

R. Univ., Upsala.

Linné, C. von. *Praeses.* Planta *Alströmeria.* [*Resp.*] J. P. FALCK. Upsaliæ, 1762. 4to.

R. Univ., Upsala.

Linné, C. von. *Praeses.* Fundamentum fructificationis. [*Resp.*] J. M. GRÅBERG. Upsaliæ, 1762. 4to.

R. Univ., Upsala.

Linné, C. von. *Praeses.* Reformatio botanices. [*Resp.*] J. M. REFTELIUS. Upsaliæ, 1762. 4to.

R. Univ., Upsala.

Linné, C. von. *Praeses.* Diss. sistens Lignum Quassiæ. [*Resp.*] C. M. BLOM. Upsaliæ, 1763. 4to.

R. Univ., Upsala.

Linné, C. von. *Praeses.* Diss. usum Muscorum. [*Resp.*] A. H. BERLIN. Upsaliæ, 1766. 4to.

R. Univ., Upsala.

Linné, C. von. *Praeses.* Diss. de *Dulcamara.* [*Resp.*] G. HALLENBERG. Upsaliæ, 1771. 4to.

R. Univ., Upsala.

Linné, C. von. *Praeses.* Diss. de *Viola Ipecacuanha.* [*Resp.*] D. WICKMAN. Upsaliæ, 1774. 4to.

R. Univ., Upsala.

Linné, C. von. *Praeses.* Diss. de *Ledo palustri.* [*Resp.*] J. P. WESTRING. Upsaliæ, 1775. 4to.

R. Univ., Upsala.

Linné, C. von. *Praeses. Hypericum.* [*Resp.*] C. N. HELLENIUS. Upsaliæ, 1776. 4to.

R. Univ., Upsala.

Linsbauer, Karl. WIESNER-Festschrift. Im Auftrage des Festkomitees redigiert von K. L. Wien, 1908. 8vo.

Liotard, L. Note on Nankin Cotton in India. Simla, 1883. 8vo.

Litschauer, Viktor. See **Hoehnel, F., Ritter von, & V. L.**

Littleton, Adam. Dr. Adam LITTLETON'S Latin dictionary, in four parts, etc. Ed. 6. London, 1735. 4to.

Sir J. D. Hooker.

Loefling, Pehr. *Resp.* Gemmæ arborum. See **Linné, C. von.** 1749.

Loesener, Theodor. Monographia Aquifoliacearum. Pars ii. (Nov. Act. Nat. Cur. lxxxix.) Halle, 1908. 4to.

London. British Museum (Natural History). Guide to SOWERBY'S Models of British Fungi. See **Smith, W. G.**

London. British Museum (Natural History). Synopsis of the British Basidiomycetes. See **Smith, W. G.**

London. The libraries of London. See **Rye, R. A.**

London Catalogue of British Plants. Ed. 10. See **Hanbury, F. J.**

Lönnberg, Ingolf. *Lolium temulentum* L. som giftväxt. (Upsala Lakareförenings Förhandl. xxvi.) [Upsala, 1891 ?] 8vo.
R. Univ., Upsala.

Loo, Augustin. *Resp.* Auctores botanici. See **Linné, C. von.** 1759.

Lund, Anders Axel Wilhelm. Wimmerby-florans Phanerogamer och Ormbunkar. Akad. Afhandl. Upsala, 1863. 8vo.
R. Univ., Upsala.

Lundström, Axel Nicolaus. Studier öfver slagtet *Salix*. Akad. Afhandl. Stockholm, 1875. 8vo.
R. Univ., Upsala.

McDonald, Donald. Agricultural writers, from Sir WALTER of Henley to Arthur YOUNG, 1200–1800. London, 1908. 8vo.

MacDougal, Daniel Trembly. The desert basins of the Colorado Delta. (Bull. Amer. Geogr. Soc. 1907.) New York, 1907. 8vo.
Author.

MacDougal, D. T. Heredity and environic forces. (Amer. Assoc. Adv. Sc. 1907–08.) Washington, D.C., 1907. 8vo.
Author.

MacDougal, D. T. Department of Botanical Research of the Carnegie Institution of Washington. Annual report of the Director, 1907. (6th Year Book Carnegie Inst. Wash.) [Washington, D.C., 1908.] 8vo.
Author.

Macfarlane, John Muirhead. Sarraceniaceae. (Engler, Das Pflanzenreich, iv. 110.) Leipzig, 1908. 8vo. —— Nepenthaceae. (Engler, Das Pflanzenreich, iv. 111.) Leipzig, 1908. 8vo.

MacKay, A. H. The Diatomaceæ of Canso Harbour, Nova Scotia. See **Canada.**

Mader, Fritz. La disparition du palmier nain autrefois sauvage dans les Alpes-Maritimes. (Ann. Soc. Lettr. Sc. et Arts des Alpes-Marit. xix.) Nice, 1905. 8vo.
Author.

Mader, F. Note floristiche di Liguria. (Atti Soc. Ligustica Sc. Nat. xvi.) (Genova, 1905.) 8vo.
Author.

Maiden, Joseph Henry. Illustrations of New South Wales Plants. Part 1. Sydney, 1907 → 4to.
Author.

Maire, René. Matériaux pour servir à l'étude de la flore et de la géographie botanique de l'Orient. 2me fasc. par R. M. et M. G. C. PETITMENGIN. (Bull. Soc. Sc. Nancy.) Nancy, 1907. 8vo.

W. Botting Hemsley.

Maize. Maize in the Punjab. See **India** (special). Punjab.

Malaya. Twentieth century impressions of British Malaya. See **Wright, A., & H. A. Cartwright.**

Maldifassi, G. See **Birdwood, Sir G. C. M.**

Mann, E. A. The examination of the Western Australian poison plants. First progress report to the Director of Agriculture. Perth, 1906. 8vo.

M. D. Ince.

Marchal, Élie. See **Cogniaux, A., & É. M.**

Martelli, Ugolino. Webbia. Raccolta di scritti botanici, edita da U.M. Vol. ii. Firenze, 1907. 8vo.

Editor.

Martin, Roland. *Resp.* Plantæ Martino-Burserianæ. See **Linné, C. von.** 1745.

Martin, T. Mower. See **Moncrieff, A. R. Hope, & T. M. M.**

Martius, Carl Friedrich Philipp von. Flora brasiliensis . . . vol. ii. pars prior. Gramineae, a NEESIO ab Esenbeck expositae. Stuttgartiae et Tubingae, 1829. 8vo.

Massalongo, Caro. Osservazioni fitologiche. (Madonna Verona, ii.) Verona, 1908. 8vo.

Author.

Matthew, Charles G. Notes on the Ferns of Hong Kong and the adjacent mainland. Edinburgh, 1908. 8vo. (Privately printed.)

Author.

Matthiesen, Franz. Beiträge zur Kenntnis der Podostemaceen. See **Bibliotheca Botanica**, Heft 68. 1908.

Menezes, Carlos Azevedo de. Especies madeirenses do genero *Bystropogon*, L'Herit. (Brotéria, iv.) Lisboa, 1905. 8vo.

Author.

Menezes, C. A. de. Catalogo das Phanerogamicas e Cryptogamicas Vasculares do archipelago da Madeira, etc. (Annaes de Sciencias Naturaes, ix.) [Porto, 1905.] 8vo.

Author.

Menezes, C. A. de. As Labiadas do archipelago da Madeira. Funchal, 1907. 8vo.

Author.

Menezes, C. A. de. Notice sur les espèces madériennes du genre *Scrophularia*. Funchal, 1908. 8vo.

Author.

Micheli, Marc. Contributions à la flore du Paraguay. VII. Labiées, par John BRIQUET. (Mém. Soc. Phys. Gen. xxxii.) Genève & Bale, 1897. 4to.

Mildbraed, J. Stylidiaceae. (Engler, Das Pflanzenreich, iv. 278.) Leipzig, 1908. 8vo.

Miller, Philip. The Gardener's Dictionary . . . Ed. 7, revised and altered. Dublin, 1764. 2 vols. 4to.

Mohr, Daniel Matthias Heinrich. See **Weber, F., & D. M. H. M.**

Molér, Wilhelm. Bidrag till kännedom om vedens byggnad hos Dvergbjörken (*Betula nana* L.). Akad. Afhandl. Upsala, 1877. 8vo.

R. Univ., Upsala.

Molisch, Hans. Grundriss einer Histochemie der pflanzlichen Genussmittel. Jena, 1891. 8vo.

Molisch, H. Die Pflanze in ihren Beziehungen zum Eisen. Jena, 1892. 8vo.

Molisch, H. Untersuchungen über das Erfrieren der Pflanzen. Jena, 1897. 8vo.

Möller, Hjalmar. Bidrag till Bornholms fossila flora. Pteridofyter. Akad. Afhandl. (Acta Reg. Soc. Physiogr. Lund. xiii.) Lund, 1902. 4to.

R. Univ., Upsala.

Moncrieff, A. R. Hope, & T. Mower Martin. Kew Gardens, painted by T. M. M., described by A. R. H. M. London, 1908. 8vo.

Montin, Lars. *Resp. Splachnum.* See **Linné, C. von.** 1750.

Moreland, William Harrison. A report on Australian methods of testing and improving Wheat and their applicability to India, with special reference to the prevention of Rust. Calcutta, 1901. 8vo.

Morini, Fausto. Intorno ad un caso teratologico nel *l'Aspidium lobatum* (Sw.) Metten., β *angulare*, Metten. (Rend. R. Accad. Sc. Ist. Bologna, N.S., xi.) (Bologna, 1907.) 8vo.

Sir J. D. Hooker.

Mosén, Hjalmar. Moss-studier på kolmoren. Akad. Afhandl. Stockholm, 1873. 8vo.

R. Univ., Upsala.

Moss, Charles E. Geographical distribution of vegetation in Somerset : Bath and Bridgwater district. London, 1907. 8vo.
Author.

Moss Exchange Club. A census catalogue of British Mosses . . . compiled under the direction of the Moss Exchange Club, by Prof. BARKER, W. INGHAM, and others. York, 1907. 8vo.

Nathorst, Alfred Gabriel. Konung OSCAR II. och den geografiska forskningen. (Ymer, 1907.) Stockholm, 1908. 8vo.
Author.

Nauclér, Samuel. *Resp.* Hortus upsaliensis. See **Linné, C. von.** 1745.

Nees von Esenbeck, Christian Gottfried. Agrostologia brasiliensis. See **Martius, C. F. P. von.** Flora brasiliensis, vol. ii. pars prior. 1829.

Neilreich, August. Flora von Nieder-Oesterreich, etc. Wien, 1858–59. 8vo.

Němec, Bohumil. Die Reizleitung und die reizleitenden Strukturen bei den Pflanzen. Jena, 1901. 8vo.

New Zealand. Agriculture in New Zealand. Ed. 2. Wellington, 1908. 8vo.
Dep. Agric., New Zealand.

New Zealand. New Zealand Flora. [Illustrations, issued by the Education Department, N.Z., n. 1–20.] [1908 ?] 4to. Notes on the illustrations of New Zealand Flora. (n. 1–20.) (Wellington, N. Z., 1908.) 8vo.
High Commissioner for New Zealand & W. E. Spencer.

Nicklès, Napoléon. Des prairies naturelles en Alsace, et des moyens de les améliorer. Strasbourg & Paris, 1839. 8vo.
Director, R.B.G., Kew.

Nilsson, Albert. Studier öfver stammen såson assimilerande organ. Akad. Afhändl. (Göteborgs K. Vet. och Vitterkets Samhälles Handl. Ny tidsföljd, häft. xxii.) Göteborg, 1887. 8vo.
R. Univ., Upsala.

Nisbet, John. Indian famines aud Indian forests. (The Nineteenth Century, July, 1908.) London, 1908. 8vo.

Nonweiler, Georg. Morphologische und physiologische Untersuchungen an *Chara strigosa* Braun. Diss. (Arb. Lab. Allg. Bot. Univ. Zürich, 10.) Borna, Leipzig, 1907. 8vo.
H. Schinz.

Norén, C. O. Zur Entwicklungsgeschichte des *Juniperus communis*. Akad. Abhandl. Uppsala, 1907. 8vo.
R. Univ., Upsala.

Nylander, William. Synopsis methodica Lichenum. Index. See **Lindau, G.** 1907.

Okamura, Kintaro. Icones of Japanese Algae, i. n. 1–8. Tokyo, 1907–08. 4to.

Oliver, Francis Wall. An experiment in co-operative field-work in botany. (Trans. S.-Eastern Un. Sc. Soc. 1907.) [s.l.] (1907.) 8vo.
Author.

Olsson-Seffer, Helen. A botanical station in Tropical Mexico. (Plant World, x.) [Washington, D.C.] (1907.) 8vo.
Author.

Olsson-Seffer, Pehr. Visits to some botanic gardens abroad, 1–13. (Plant World, x.) [Washington, D.C., 1907.] 8vo.
Author.

Olsson-Seffer, P. The present condition of Rubber culture. (Year Book, Rubber Planters' Assoc., Mexico, 1907–08.) (Mexico, 1908.) 4to.
Author.

Orcutt, Charles Russell. See **American Plants.** § 3.

Örström, Carl Abraham. Bidrag till kännedomen om vedens bygg nad uti stam ooh grenar hos granen (*Pinus Abies*, L.). Akad. Afhandl. Upsala, 1874. 8vo.
R. Univ., Upsala.

Ostenfeld, C. H. The Phytoplankton of the Aral Sea and its affluents, with an enumeration of the Algae observed. (Mitteil. Turkestan. Abteil. K. Russ. Geogr. Ges. iv.) St. Petersburg, 1908. 8vo.
Author.

Ostenfeld, C. H. Plantes récoltées à la côte nord-est du Grönland. (DUC D'ORLÉANS, Croisière océanogr. de la Belgica dans la mer du Grönland, 1905.) Bruxelles, 1908. 4to.
Author.

Ostenfeld, C. H. On the ecology and distribution of the Grass-Wrack (*Zostera marina*) in Danish waters. (PETERSEN, Rep. Danish Biol. Stat. 1908, translated from "Fiskeri-Beretning" for 1907.) Copenhagen, 1908. 4to.
Author.

Oster. — Exkursion in den Stadtwald von Eschweiler zur Besichtigung der Hüttenrauchbeschädigungen am 5. September 1887. See **Wieler, A. L.**

Pardo de Tavera, T. H. The medicinal plants of the Philippines. Translated and revised by Jerome B. THOMAS. Philadelphia, 1901. 8vo.

Pascher, Adolf A. Studien über die Schwärmer einiger Süsswasseralgen. See **Bibliotheca Botanica**, Heft 67. 1907.

Pax, Ferdinand. Grundzüge der Pflanzenverbreitung in den Karpathen. See **Engler, A., & O. Drude.** Die Vegetation der Erde, ii. & x.

Payne, Charles Harman. The florist's bibliography. London, 1908. 8vo.

Pelletan, J. Le Microscope; son emploi et ses applications. Paris, 1876. 8vo.

W. Botting Hemsley.

Penhallow, David Pearce. Report on the tertiary plants of British Columbia collected by Lawrence M. LAMBE in 1906, etc. (Canada Dep. of Mines. Geol. Surv. Branch.) Ottawa, 1908. 4to.

Author.

Penhallow, D. P. Report on a collection of fossil woods from the Cretaceous of Alberta. (Ottawa Nat. xxii.) Ottawa, 1908. 8vo.

Author.

Penhallow, D. P. See **Cairnes, D. D.**

Penlington, William. See **Birdwood, Sir G. C. M.**

Péragallo, H. Sur les Diatomées de l'aquarium à *O[cillatoria] Cortiana* du laboratoire de Banyuls-sur-Mer. (Comptes rendus Soc. Biol. Bordeaux, Jan. 1908.) [Paris, 1908.] 8vo.

C. Sauvageau.

Perkin, Arthur George. Artificial Indigo. (Proc. Phil. Soc. Glasgow, xiii.) [Glasgow] (1881.) 8vo.

Perkin, A. G. Constituents of the Indian dyestuff Waras, *Flemingia congesta*. (Trans. Chem. Soc. 1898.) [London] (1898.) 8vo.

Perkin, A. G., & Julius Aldred Pilgrim. The colouring matters of the Indian dye stuff Asbarg, *Delphinium Zalil*. (Trans. Chem. Soc. 1898.) [London] (1898.) 8vo.

Perrier de la Bathie, H. See **Jumelle, H., & H. P. de la B.**

Peters, Karl. Vergleichende Untersuchungen über die Ausbildung der sexuellen Reproduktionsorgane bei *Convolvulus* und *Cuscuta*. (Arb. Lab. Allg. Bot. Univ. Zürich, 12.) Diss.

H. Schinz.

Petit, Paul. Diatomées récoltées par la mission CHEVALIER, au Chari-Tchad. See **Chevalier, A.** § 2.

Petitmengin, Marcel Georges Charles. Sur deux nouveaux hybrides et quelques nouvelles contributions à la Flore Lorraine. (Bull. Soc. Sc. Nancy.) [Nancy, 1908 ?] 8vo.

W. Botting Hemsley.

Petitmengin, M. G. C. Quelques nouveautés botaniques du Queyras (Hautes-Alpes). (Bull. Soc. Sc. Nancy.) [Nancy, 1908 ?] 8vo.

W. Botting Hemsley.

Petitmengin, M. G. C. A propos des *Isatis Djurdjurae* Coss. et Dur. et *I. alpina*, Vill. (All.) (Bull. Soc. Sc. Nancy.) [Nancy, 1908 ?] 8vo.

W. Botting Hemsley.

Petitmengin, M. G. C. See **Maire, R.**

Pfeiffer, Franz. See **Alemann, Conrad von.**

Pfeiffer, Johann. *Resp.* Fungus melitensis. See **Linné, C. von.** 1755.

Pfitzer, Ernest. Gedächtnisrede. See **Tischler, G.**

Pickering, Spencer Percival Umfreville, & Frederick V. Theobald. Fruit trees and their enemies, with a spraying calendar. London, 1908. 8vo.

S. P. U. Pickering.

Pierre, C. L'Élevage dans l'Afrique occidentale française. See **Africa.** Afrique occidentale française.

Pilgrim, Julius Aldred. See **Perkin, A. G., & J. A. P.**

Playfair, Patrick. See **Watt, Sir G., & P. P.** 1884.

Pohath-Kehelpannala, T. B. The Kitul [*Caryota wrens*] and its uses. (Colombo, 1898.) 8vo.

Pontin, David Davidis. *Resp.* Arboretum svecicum. See **Linné, C. von.** 1759.

Potter, Michael Cresse. Observations on a disease producing the "Deaf-ear" of the Barley. (Journ. Newcastle Farmers' Club, Jan. 1908.) [Newcastle-on-Tyne ?] (1908.) 8vo.

Author.

Practical husbandman and planter . . . by a society of husbandmen and planters, (printed for S. SWITZER, principal assistant to the society.) London [c. 1735.] 2 vols. 8vo.

Prain, David. Index kewensis. Suppl. 3. See **Kew.** Royal Botanic Gardens.

Prain, D. Report on the cultivation and use of Gánjá [*Cannabis sativa*, L.] Calcutta, 1893. fol.

Printz, Jacob. *Resp.* Plantae rariores africanae. See **Linné, C. von.** 1760.

Proudlock, Robert L. Note on simple machines for extracting Plantain fibre. Madras, 1901. 8vo.

Ramaley, Francis. Plant zones in the Rocky Mountains of Colorado. (Science, N.S. xxv.) [New York] (1907.) 8vo.
Author.

Ramaley, F. The silva of Colorado, 1–3. (Univ. of Colorado Studies, iv–v.) (Boulder, 1907.) 8vo.
Author.

Ramaley, F. Botany of Northeastern Larimer Country, Colorado. (Univ. of Colorado Studies, v.) (Boulder, 1908.) 8vo.
Author.

Ramaley, F. The botanical gardens of Ceylon. (Popular Science Monthly, lxxiii.) [New York] (1908.) 8vo.
Author.

Ramaley, F., & W. W. Robbins. Ecological notes from North-central Colorada. (Univ. of Colorado Studies, v.) (Boulder, 1908). 8vo.
Authors.

Rechinger, Karl. Botanische und zoologische Ergebnisse einer wissenschaftlichen Forschungsreise nach den Samoainseln, dem Neuguinea-Archipel und den Salomonsinseln . . . 1905. 1. Teil. (Denkschr. Akad. Wien, lxxxi.) Wien, 1907. 4to.
Author.

Reftelius, Johan Mårten. *Resp.* Reformatio botanices. See **Linné, C. von.** 1762.

Reinbold, Theodor. Die Meeresalgen der deutscher Tiefsee-Expedition. See **"Valdivia."**

Reith, G. M. Handbook to Singapore, with map. Ed. 2, revised by W. MAKEPEACE. [Flora of Singapore Island, by H. N. RIDLEY, pp. 117–123.] Singapore, 1907. 8vo.
H. N. Ridley.

Reports on the cultivation of Spanish Chestnut. See **Birdwood, Sir G. C. M.**

Ribera Gómez, Emilio. Manual sobre árboles frutales escrito especialmente para América. Paris [s.a.] 12mo.

Ridley, Henry Nicholas. Materials for a Flora of the Malayan Peninsula. Monocotyledons. i–[iii.] Singapore, 1907–08. 8vo.
Author.

Ridley, H. N. Flora of Singapore. See **Reith, G. M.**

Ridley, H. N. See **Wright, A., & H. A. Cartwright.**

Robbins, W. W. See **Ramaley, F., & W. W. R.**

Robertson, R. A., & Others. A contribution to the chemistry and physiological action of the humic acids. (Bio-Chem. Journ. ii.) [Liverpool] (1907.) 8vo.

R. A. Robertson.

Robinson, Benjamin Lincoln. See **Gray, A.** New manual of Botany, ed. 7.

Robinson, Charles Budd. The Sea Weeds of Canso, Nova Scotia. See **Canada.**

Robinson, William. See **Vilmorin-Andrieux & Cie.** The vegetable garden.

Romanus, Anton. Bidrag till kännedomen om de nödvändiga mineralbasernas (kalk, kali, magnesia) funktioner i de högre växterna. Akad. Afhandl. (Acta Reg. Soc. Physiogr. Lund, viii.) Lund, 1899. 4to.

R. Univ., Upsala.

Romero, Matias. Coffee and India-Rubber culture in Mexico, preceded by geographical and statistical notes on Mexico. New York & London, 1898. 8vo.

Rosenthal, Christian Fredrik. *Resp.* Flora belgica. See **Linné, C. von.** 1760.

Rothamsted. The book of Rothamsted experiments. See **Hall, A. D.**

Royle, John Forbes. Review of the measures which have been adopted in India for the improved culture of Cotton. London, 1857. 8vo.

Rudberg, Daniel. *Resp.* Peloria. See **Linné, C. von.** 1744.

Russell, Thomas Hawkes. Mosses and Liverworts. An introduction to their study, with hints as to their collection and preservation. London, 1908. 8vo.

Rye, Reginald Arthur. The libraries of London : a guide for students. London, 1908. 8vo.

Author.

Saccardo, Pier Andrea. Un manipolo della flora del Monte Cavallo desunto dalle iconografie inedite di G. G. ZANNICHELLI. (Atti R. Ist. Veneto di Scienze, lxvi. 2.) Venezia, 1907. 8vo.

Author.

Salmon, Ernest Stanley. Report on Economic Mycology for the year ending April 1st, 1907. (S.-Eastern Agric. Coll. Journ. n. 16.) [London] (1907.) 8vo.

Author.

Salmon, E. S. Report on Economic Mycology for year ending July, 1908. (S.-Eastern Agric. Coll. Wye.) London & Ashford, Kent, [1908.] 8vo.

Author.

Salmon, E. S. "Black Scab" or "Warty Disease" of Potatoes. (S.-Eastern Agric. Coll. Leaflet.) [London, 1908.] 8vo.

Author.

Sandmark, Carl Gustaf. *Resp.* Flora jamaicensis. See **Linné, C. von.** 1759.

Saracomenos, Diomede. Treatise on the *Oecophora* of Wheat (*Oecophora temperatella*). Nicosia, Cyprus, 1908. 8vo.

Author.

Sargent, Charles Sprague. *Crataegus* in Southern Michigan. (Geol. Surv. Mich. Rep. 1906.) Lansing, Michigan, 1907. 8vo.

Author.

Sargent, C. S. *Crataegus* in Southern Ontario. (Ontario Nat. Sc. Bull. 1908, n. 4.) [Toronto ?] 1908. 8vo.

Author.

Sargent, C. S. *Crataegus* in Missouri. (Rep. Missouri Bot. Gard. xix.) [St. Louis] (1908.) 8vo.

Author.

Sargent, C. S. Some additions to the *Crataegus* flora of western New York. —— Notes on a collection of *Crataegus* made by Mr. G. D. CORNELL, &c. —— New York species of *Crataegus*, &c. (New York State Mus. Bull. 122.) Albany, 1908. 8vo.

Author.

Sauvageau, Camille. Sur deux *Fucus* vivant sur le sable. —— Sur un *Fucus* qui vit sur la vase. (Comptes rendus Soc. Biol. Bordeaux, Dec. 1907.) [Paris, 1908.] 8vo.

Author.

Sauvageau, C. Sur des Myxophycées roses et sur un procédé d'étude de la phycocyane. —— Àpropos d'Oscillariés rouges observées dans un aquarium du laboratoire de Banyuls-sur-Mer. —— Sur la coloration des Floridées. (Comptes rendus Soc. Biol. Bordeaux, Jan. 1908.) [Paris, 1908.] 8vo.

Author.

Sauvageau, C. Nouvelles observations sur la germination du *Cladostephus verticillatus*. —— Sur la germination des zoospores de *l'Aglaozonia melanoidea*. —— Sur la germination parthénogénétique du *Cutleria adspersa*. —— Sur les cultures cellulaires d'Algues. (Comptes rendus Soc. Biol. Bordeaux, Avril, 1908.) [Paris, 1908.] 8vo.

Author.

Savariau, N. L'Agriculture au Dahomey. See **Africa. Afrique occidentale française.**

Savatier, Lodovic. Les algues marines rapportées de Yokoska (Japon.) See **Hariot, P. 1891.**

Schenck, Heinrich. I. Vergleichende Darstellung der Pflanzengeographie der subantarktischen Inseln, etc. II. Ueber Flora . . . von St. Paul und Neu-Amsterdam. III. Beitr. z. Kenntn. der canarischen Inseln. See "**Valdivia.**"

Schiffner, Victor. See **Wettstein von Westersheim, R., Ritter von, & V. S.**

Schinz, Hans. Mitteilungen aus dem Botanischen Museum der Universität Zürich. Herausg. von H. S. — xxxv. Zur Systematik von *Castalia* und *Nymphaea*, von J. SCHUSTER. (Bull. Herb. Boiss. 2, vii–viii.) Genève, 1906. 8vo. — xxxvi. 1. Beitr. zur Kenntnis der afrik. Flora, N.F., xx. 2. Beitr. zur Kenntnis der Schweizerflora, viii. von A. THELLUNG & H. SCHINZ. (Viertelj. Naturf. Ges. Zürich, lii.) Zürich, 1907. 8vo.—xxxvii. Monografia floristica del Monte Camoghè (presso Bellinzona.) Diss., da Mario JAEGGLI. (Boll. Soc. Ticinese Sc. Nat. iv.) Bellinzona, 1908. 8vo.

Editor.

Schlechter, Friedrich Richard Rudolf. Pflanzengeographische Gliederung der Insel Neu-Caledonien. Diss. (Engl. Bot. Jahrb. xxxvi.) (Leipzig) [1905.] 8vo.

W. Botting Hemsley.

Schlich, William. SCHLICH'S Manual of Forestry, v. Forest utilization, by W. R. FISHER, being an English translation of "Die Forstbenutzung," by Karl GAYER. Ed. 2. London, 1908. 8vo.

Secretary of State for India.

Schniewind-Thies, J. Die Reduktion der Chromosomenzahl und die ihr folgenden Kernteilungen in den Embryosackmutterzellen der Angiospermen. Jena, 1901. 8vo.

Schwaighofer, Karl Fritz. Ist *Zahlbrucknera* als eigene Gattung beizubehalten oder wieder mit *Saxifraga* zu vereinigen? (Sitzungsb. Akad. Wien, cxvii.) Wien, 1908. 8vo.

Sir J. D. Hooker.

Schwarz, Frank. Die Erkrankung der Kiefern durch *Cenangium Abietis*. Beitrag zur Geschichte einer Pilzepidemie. Jena, 1895. 8vo.

Schweinfurth, Georg. Ueber die Pflanzenreste aus [den Gräbern] mk. 29 und 30 [der Zeit der xiiten Dynastie]. (Wissenschaftl. Veröffentl. Deutsch. Orient-Gesellsch., 8. Priestergräber, etc.) Leipzig, 1908. 4to.

Author.

Schweinfurth, G. Veröffentlichte Briefe, Aufsätze und Werke, 1860–1907, von G. S. Berlin, 1907. 8vo.

Author.

Scots gardiners director, 1759. See **Justice, J.**

Scott, Dukinfield Henry. See **Solereder, H.** 1908.

Senn, G. Alpen-Flora. Westalpen. Heidelberg [s.a.] 12mo.

Seward, Albert Charles. Permo-carboniferous plants from Kashmir. (Records Geol. Surv. Ind. xxxvi.) [Calcutta] (1907.) 8vo.

Author.

Seward, A. C. Fossil plants from South Africa. (Quart. Journ. Geol. Soc. lxiv.) [London] (1908.) 8vo.

Author.

Seward, A. C. Jurassic plants from Caucasia and Turkestan. (Mém. Comité Géol. [Russ.] n.s. livr. 38.) St. Pétersbourg, 1907. 4to.

Seward, A. C. & Thomas Nicholas Leslie. Permo-carboniferous plants from Vereeniging (Transvaal). (Quart. Journ. Geol. Soc. lxiv.) [London] (1908.) 8vo.

Authors.

Sextius Niger. See **Wellmann, M.**

Shaw, Mary Helen. Phycologia barbadensis. See **Vickers, A.**

Sheppard, Edgar. George, Duke of Cambridge; a memoir of his private life based on the journals and correspondence of His Royal Highness. London, 1906. 2 vols. 8vo.

Shirasawa, Homi. Iconographie des essences forestières du Japon. ii. Planches. Tokio, 1908. fol.

Author.

Shore, L. E. A contribution to our knowledge of taste sensations [based on an examination of the action of the leaves of *Gymnema sylvestre*.] (Journ. of Physiol. xiii.) [London] (1892.) 8vo.

Simpson, Samuel. British Central Africa Protectorate. Report on the Cotton-growing industry. [London] 1905. fol.

Skårman, Johan Albert Otto. Om Salixvegetationen i Klarelfvens Floddal. Akad. Afhandl. Upsala, 1892. 8vo.

R. Univ., Upsala.

Smith, F. B. Some observations upon the probable effect of the closer union of South Africa upon agriculture. (S. African Assoc. Adv. Sc. 1908.) Pretoria, 1908. 8vo.

Author.

Smith, John Donnell. See **Icones plantarum centrali-americanarum.**

Smith, J. D. Catalogue of the library of J. D. S. See **Attwood, A. C.**

Smith, Johannes Jacobus. Die Orchideen von Java. Figuren-Atlas. Heft I. Leiden, 1908. 8vo.
Director of Agriculture, Dutch E. Indies.

Smith, Worthington George. Guide to SOWERBY'S Models of British Fungi in the Department of Botany, British Museum (Natural History). Ed. 2, revised. [London] 1908. 8vo.
Trustees of the British Museum.

Smith, W. G. Synopsis of the British Basidiomycetes: a descriptive catalogue of the drawings and specimens in the Department of Botany, British Museum. London 1908. 8vo.
Trustees of the British Museum.

Solereder, Hans. Systematische Anatomie der Dicotyledonen. Ergänzungsband. Stuttgart, 1908. 8vo.

Solereder, H. Systematic anatomy of the Dicotyledons. Translated by L. A. BOODLE and F. E. FRITSCH. Revised by D. H. SCOTT. Oxford, 1908. 2 vols. 8vo.
Translators.

Sprecher, Andreas. Le *Ginkgo biloba* L. Thèse. (Univ. de Genève, Inst. de Bot., 7me sér., 10me fasc.) Genève, 1907. 8vo.
R. Chodat.

Sprengel, Kurt. Geschichte der Botanik, neu bearbeitet. Altenburg & Leipzig, 1817–18. 2 vols. 8vo.

Stallybrass, James Steven. See **Hehn, V.** 1885.

Stebbing, Edward Percy. A manual of elementary forest Zoology for India. Calcutta, 1908. 8vo.
Inspector General of Forests, India.

Stenström, K. O. E. Värmländska Archieracier. Anteckningar till Skandinaviens *Hieracium*-Flora. Upsala, 1889. 8vo.
R. Univ., Upsala.

Stieler, Adolf. Hand-Atlas. See **Atlases.**

Stowe. A description of the house and gardens of the Most Noble R. G. N. CHANDOS TEMPLE, Duke of Buckingham & Chandos. Buckingham, 1832. 8vo.

Strand, Bengt Johan. *Resp.* Flora palæstina. See **Linné, C. von.** 1756.

Strettell, George W. A new source of revenue for India [by cultivating *Calotropis gigantea*]. London, 1878. 8vo.

Strömfelt, Harald Fredrik Georg. Undersökningar öfver algernas vidfastningsorgan. Upsala, 1887. 8vo.

R. Univ., Upsala.

Sudan. Sudan Almanac, 1907. London (1907.) 8vo.

Sudre, H. Les *Rubus* de l'Herbier BOREAU. (Bull Soc. Études Sc. Angers, 1902.) [Angers, 1902.] 8vo.

Sudre, H. Observations sur "Set of British *Rubi*." (Bull. Soc. Études Sc. Angers, 1904.) [Angers, 1904.] 8vo.

Sudre, H. Un bouquet de Ronce bretonnes. (Bull. Soc. Études Sc. Angers, 1904.) [Angers, 1904.] 8vo.

Switzer, Stephen. The practical kitchen gardiner, etc. London, 1727. 8vo.

Switzer, S. See **Practical husbandman and planter.**

Sydow, Paul. See **Lindau G., & P. S.** 1907.

Tammes, Tine. Der Flachsstengel. Eine statistisch-anatomische Monographie. (Natuurkund. Verh. Hollandsche Maatschappij Wetenschap. Derde Verzameling, vi. 4e Stuk.) Haarlem, 1907. 4to.

Dutch Soc. Sc. Haarlem.

Tavera, T. H. Pardo de. See **Pardo de Tavera, T. H.**

Tedin, Hans. Bidrag till kännedomen om primära barken hos vedartade dikotyler, dess anatomi och dess funktioner. Akad. Afhandl. (Lunds Univ. Årsskr. xxvii.) Lund, 1891. 4to.

R. Univ., Upsala.

Théel, Jakob Gustaf. De Skandinaviska arterna af slägtet *Scapania* bland Lefvermossorna. Akad. Afhand. Stockholm, 1872. 8vo.

R. Univ., Upsala.

Theobald, Frederick V. See **Pickering, S. P. U., & F. V. T.**

Theorin, Pehr Gustaf Emanuel. Iakttagelser rörande öfverhudens bihang hos växterna. Akad. Afhandl. Upsala, 1866. 8vo.

R. Univ., Upsala.

Theorin, P. G. E. Om växternas hår och yttre glandler. Några anmärkningar. Calmar, 1867. 8vo.

R. Univ., Upsala.

Thomas, Jerome B. See **Pardo de Tavera, T. H.**

Thomson, Thomas. History of the Royal Society [of London], from its institution to the end of the eighteenth century. London, 1812. 4to.

Edward Smith.

Thonner, Franz. Exkursionsflora von Europa. Berlin, 1901. 8vo.
Author.

Thonner, F. Die Blütenpflanzen Afrikas: eine Anleitung zum Bestimmen der Gattungen der afrikanischen Siphonogamen. Berlin, 1908. 8vo.
Author.

Times Gazetteer of the World. See **Chisholm, G. G.**

Tischler, Georg. Ernst PFITZER. Gedächtnisrede, etc. Verhandl. Nat.-Med. Ver. Heidelb. N.F. viii.) Heidelberg, 1907. 8vo.
Sir J. D. Hooker.

Trana, Er. Andr. Historisk framställning af åsigterna om den typiska pollenutvecklingen. Akad. Afhandl. Stockholm, 1872. 8vo.
R. Univ., Upsala.

Treutler, W. J. GOETHE as a Naturalist. (Trans. S. Eastern Un. Sc. Soc. 1907). 8vo.
J. G. Baker.

Trinidad. Botanical Department. Herbarium list. See **Hart, J. H.**

Troup, R. S. Indian forest utilization. . Calcutta, 1907. 8vo.
Inspector General of Forests, India.

Turner, Frederick. Our rarest plant [*Tecoma Hillii*]. How it was discovered. (Sydney Morning Herald, Aug. 19, 1908.) (Sydney, 1908.)

Tursén, Erland Zacharias. *Resp.* De Anandria. See **Linné, C. von.** 1745.

Uganda. General report on the Uganda Protectorate . . . 1904. London, 1904. fol.

Uganda. Scientific and Forestry Department. Reports, 1903–04, 1904–05 [by M. T. DAWE]. [London] 1904–05. fol.

Ullmark, Henrik. *Resp.* Prolepsis plantarum. See **Linné, C. von.** 1760.

Underwood, Lucien Marcus. Obituary notice. See **Britton, N. L.**

"Valdivia." Wissenschaftliche Ergebnisse der deutschen Tiefsee-Expedition auf dem Dampfer Valdivia 1898–1899 . . . herausg. von Carl CHUN. Bd. ii. Teil i. Lfg. 1. SCHENCK, H. I. Vergleichende Darstellung der Pflanzengeographie der subantarktischen Inseln insbesondere über Flora und Vegetation von Kerguelen, mit Einfügung hinterlassener Schriften A. F. W. SCHIMPERS. II. Ueber Flora und Vegetation von St. Paul und Neu-Amsterdam. Text & Atlas. Jena, 1905. 4to.—Bd. ii. Teil i. Lfg. 2. SCHENCK, H. III.

Beiträge zur Kenntnis der canarischen Inseln. Ib., 1907. 4to.—Bd. ii. Teil ii. Lfg. 1. KARSTEN, G. Das Phytoplankton des antarktischen Meeres, etc. Text & Atlas. Ib., 1905. 4to.—Bd. ii. Teil ii. Lfg. 2. KARSTEN, G. Das Phytoplankton des atlantischen Oceans, etc. Ib., 1906. 4to.—Bd. ii. Teil ii. Lfg. 3. KARSTEN, G. Das indische Phytoplankton. Text & Atlas. Ib., 1907. 4to.—Bd. ii. Teil ii. Lfg. 4. REINBOLD, Th. Die Meeresalgen, etc. Ib., 1907. 4to.

Valeton, Theodoric. See **Koorders, S. H., & T. V.**

Valette, Th. See **Klincksieck, P., & Th. V.**

Vallemont, Pierre Lorrain, Abbé de. Curiositez de la nature et de l'art sur la végétation, ou l'agriculture et le jardinage dans leur perfection, etc. Bruxelles, 1715. 2 vols. Sm. 8vo.

Veitch, James Herbert. The Veitchian Nurseries. (London) 1903. Obl. 4to.

W. Botting Hemsley.

Vickers, Anna. Phycologia barbadensis. Iconographie des Algues marines récoltées à l'Ile Barbade (Antilles), (Chlorophycées et Phéophycées), par A. V. Avec texte explicatif par Mary Helen SHAW. Paris, 1908. 4to.

Vilmorin, Henry Lévêque de. Les meilleures Pommes de terre. Ed. 2. Paris, 1893. 8vo.

Vilmorin-Andrieux & Cie.

Vilmorin, H. L. de. Catalogue méthodique et synonymique des Froments qui composent la collection de H. L. de V. Ed. 2. Paris, 1895. 8vo.

Vilmorin-Andrieux & Cie.

Vilmorin, H. L. de. See **Vilmorin-Andrieux & Cie.** 1908.

Vilmorin, Philippe Lévêque de. Catalogue méthodique et synonomique des principales variétés de Pommes de terre. Ed. 3. Paris, 1902. 8vo.

Author.

Vilmorin, P. L. de. Hortus Vilmorinianus, etc. Préface de Ch. FLAHAULT. Verrières-le-Buisson, 1906. 8vo. (Published also in Bull. Soc. Bot. France, li. Appendix.)

Author.

Vilmorin, P. L. de. Manuel de floriculture. Paris, 1908. 12mo.

Author.

Vilmorin-Andrieux & Cie. Album de clichés, comprenant toutes les illustrations des ouvrages et catalogues publiés par V.-A. & Cie. Ed. 2. Paris, 1888. 4to. —— Supplément, n. 1. Ed. 2. [s.l.e.a.]—n. 2–7. Ed. 2. Paris, 1890–1906. 4to.

Authors.

Vilmorin-Andrieux & Cie. Instructions pour les semis de fleurs de pleine terre, etc. Ed. 8. Paris, 1903. 8vo.

Authors.

Vilmorin-Andrieux & Cie. Les plantes potagères, etc. Ed. 3. Paris, 1904. 8vo.

Authors.

Vilmorin-Andrieux & Cie. The vegetable garden, etc. English edition, published under the direction of W. ROBINSON. London, 1905. 8vo.

Vilmorin-Andrieux & Cie.

Vilmorin-Andrieux & Cie. Les différentes cultures du Chrysanthème. Introduction par H. L. de VILMORIN. Ed. 2. Paris, 1908. 8vo.

Authors.

Virgander, David Magnus. *Resp.* Frutetum svecicum. See **Linné, C. von.** 1758.

Wagner, Hermann. Die Familien der Halbgräser und Gräser (Juncaceen, Cyperaceen und Gramineen.) Erste [und zweite] Abtheilung. Bielefeld, 1857. 8vo.

Wagner, Rudolf. Ueber den Aufbau des *Disepalum anomalum*, Hook. fil. (Sitzungsb. Akad. Wien, cxv.) Wien, 1906. 8vo.

Sir J. D. Hooker.

Wagner, R. Beiträge zur Kenntnis einiger *Amorpha*-Arten. (Sitzungsb. Akad. Wien, cxvi.) Wien, 1907. 8vo.

Sir J. D. Hooker.

Wagner, R. Zur Morphologie der *Sanchezia nobilis*, Hook. fil. (Sitzungsb. Akad. Wien, cxvi.) Wien, 1907. 8vo.

Sir J. D. Hooker.

Wahlblom, Johan Gustav. *Resp.* Sponsalia plantarum. See **Linné, C. von.** 1746.

Wahlenberg, Göran. Historisk underrättelse om Upsala Universitets botaniska trägård. (Skandia, ix.) Upsala, 1837. 8vo.

R. Univ., Upsala.

Wallace, Alfred Russel. See **Spruce, R.** § 2.

Wallace, Robert. The rural economy and agriculture of Australia and New Zealand. London, 1891, 8vo.

Wännman, Carl Henrik. *Resp.* Flora capensis. See **Linné, C. von.** 1759.

Watt, Sir George. Preliminary list of the Economic Products of India. Pt. I. Gums and Resins.—Pt. II. Dyes, Tans and Mordants. —Pt. III. Fibre-yielding Plants. [Proofs.] Calcutta, 1883. fol.

Watt, Sir G. Hemp or *Cannabis sativa*, Linn. (An enlargement of the article in Dict. Econ. Prod. Ind.) [Calcutta] (1887.) 8vo.

Watt, Sir G. The commercial products of India, being an abridgment of "The dictionary of the economic products of India." London, 1908. 8vo.

Secretary of State for India (3 copies).

Watt, Sir G., & Patrick Playfair. Papers relating to the corrosion of the lead lining of tea chests. Calcutta, 1884. 8vo.

Watzl, B. See **Janchen, E., & B. W.**

Webbia. See **Martelli, U.**

Weber, Friedrich, & Daniel Matthias Heinrich Mohr. Beiträge zur Naturkunde . . . herausg. von F. W. und D. M. H. M. Bd. i [— ii.] Kiel, 1805–10. 8vo.

Wellmann, Max. SEXTIUS NIGER, eine Quellenuntersuchung zu DIOSCORIDES. (Hermes, xxiv.) Berlin, 1889. 8vo.

Wellmann, M. KRATEUAS. (Abhandl. K. Ges. Wiss. Goettingen. Phil.-Hist. Kl. N. F. ii.) Berlin, 1897. 4to.

Wellmann, M. Die Pflanzennamen des DIOSKURIDES. (Hermes, xxxiii.) Berlin, 1898. 8vo.

Wellmann, M. Das älteste Kräuterbuch der Griechen. (Festgabe für Franz SUSEMIHL.) Leipzig, 1898. 8vo.

Westring, Johan Peter. *Resp.* De *Ledo palustri.* See **Linné, C. von.** 1775.

Wettstein von Westersheim, Richard, Ritter von. Handbuch der systematischen Botanik. Leipzig & Wien, 1901–08. 2 vols. 8vo.

Wettstein von Westersheim, R., Ritter von. Die Biologie unserer Wiesenpflanzen. (Vortr. Ver. Verbreit. Naturwiss. Kennt. Wien, xliv.) Wien, 1904. 8vo.

Author.

Wettstein von Westersheim, R., Ritter von. Ueber das Vorkommen zweigeschlechtiger Infloreszenzen bei *Ephedra.* (Festschr. Naturwiss. Ver. Univ. Wien, Nov. 1907.) Wien, 1907. 8vo.

Author.

Wettstein von Westersheim, R., Ritter von. See **Kronfeld, E. M.**

Wettstein von Westersheim, R., Ritter von, & Victor Schiffner. Ergebnisse der botanischen Expedition der kaiserlichen Akademie der Wissenschaften [Wien] nach Südbrasilien, 1901, herausg. von R. W. und V. S. Bd. i. Pteridophyta und Anthophyta, unter Mitwirkung zahlreicher Fachmänner, herausg. von R. v. W. Erster Halbband. (Denkschr. Akad. Wien, lxxix.) Wien, 1908. 4to.

R., Ritter von Wettstein von Westerheim.

White, James. Atlas of Canada. See **Atlases.**

Wickman, Daniel. *Resp.* De *Viola Ipecacuanha.* See **Linné, C. von.** 1774.

Wieler, Arwed Ludwig. Untersuchungen über die Einwirkung schwefliger Säure auf die Pflanzen. Nebst einem Anhange : OSTER, Exkursion in den Stadtwald von Eschweiler zur Besichtigung der Hüttenrauchbeschädigungen am 5. September, 1887. Berlin, 1905. 8vo.

Wiesner, Julius. WEISNER-Festschrift. See **Linsbauer, K.**

Wigley, F. G. Note on Sorgho (*Sorghum saccharatum.*) (India Dep.Revenue, Agric. & Commerce) [Calcutta] 1877. fol.

Wilkinson, Henry J. Catalogue of British plants in the herbarium of the Yorkshire Philosophical Society. Part i [–x.] [York, s.a.] 8vo.

Sir J. D. Hooker.

Wilkinson, H. J. Historical account of the herbarium of the Yorkshire Philosophical Society and the contributors thereto. Part i. [York, 1907.] 8vo.

J. G. Baker.

Williams, Frederic Newton. Florula gambica : une contribution à la flore de la colonie britannique de la Gambie. (Bull. Herb. Boiss. 2, vii.) Genève (1907.) 8vo.

Author.

Willis, John Christopher. Ceylon : a handbook for the resident and the traveller. Colombo & Peradeniya, 1907. 8vo.

Author.

Wiman, Johan. *Resp.* *Euphorbia* ejusque historia naturalis et medica. See **Linné, C. von.** 1752.

Winton, Andrew L. See **Hanausek, T. F.** 1907.

Withering, William. An account of the Foxglove and some of its medical uses, etc. Birmingham, 1785. 8vo.

Wittmack, Louis. Eine junge Fichte von einem Baumschwamm umwallt. (Sitzungsb. Ges. Naturforsch. Freunde, 1907.) [Berlin] (1907.) 8vo.

Author.

Wittmack, L. Die ersten Abbildungen der Dahlien. (Sitzungsb. Ges. Naturforsch. Freunde, 1907.) [Berlin] (1907.) 8vo.

Author.

Wittrock, Veit Brecher. Försök till en monographi öfver algslägtet *Monostroma.* Akad. Afhandl. 1866. 8vo.

K. Univ., Upsala.

Wolf, Theodor. Monographie der Gattung *Potentilla*. See **Bibliotheca Botanica**, Heft 71. 1908.

Wolff, Arthur. Zur Kenntnis der Veränderungen in der Bakterienflora der frischen Milch während des sog. Inkubationsstadiums. Diss. Zürich, 1908. 8vo.

H. Schinz.

Wollrath, Johan Gustav. *Resp.* Diss. de horticultura academica. See **Linné, C. von.** 1754.

Wood, John Medley. Revised list of the flora of Natal. (Trans. S. Afr. Phil. Soc. xviii.) Cape Town, 1908. 8vo.

Author.

Wood-Mason, J. Report on the tea-mite and the tea-bug of Assam. London, 1884. 8vo.

Woodward, Robert, Junr. Catalogue of hardy trees and shrubs, including Coniferæ, growing in the grounds of Arley Castle. (Privately printed, 1907.) 8vo.

Author.

Wright, Arnold, & H. A. Cartwright. Twentieth century impressions of British Malaya: its history, people, commerce, industries, and resources. Editors: A. W. & H. A. C. (Botany, by H. N. RIDLEY, pp. 331–336.) London, etc., 1908. 4to.

Secretary of State for the Colonies.

Wright, Herbert. *Hevea brasiliensis* or Pará Rubber, etc. Ed. 3. Colombo, 1908. 8vo.

Author.

Wright, R. Ramsay. The Plankton of Eastern Nova Scotia waters. See **Canada.**

Wulff, Thorild. Botanische Beobachtungen aus Spitzbergen. Lund, 1902. 8vo.

Sir J. D. Hooker.

Zahlbruckner, Alexander. Botanische und zoologische Ergebnisse einer wissenschaftlichen Forschungsreise nach den Samoa-Inseln, etc. IV. Die Flechten der Samoa-Inseln bearbeitet von A. Z. (Denkschr. Akad. Wien, lxxxi.) Wien, 1907. 4to.

Author.

Zahn, Karl Hermann. Die Hieracien der Schweiz. (Neue Denkschr. Schweiz. Gesellsch. Naturwiss. xl.) Basel, Genève & Lyon, 1906. 4to.

Sir Frank Crisp.

Zannichelli, Gian Girolamo. See **Saccardo, P. A.** 1907.

Zetterstedt, Johan Emanuel. Om växtgeographiens studium. Upsala, 1863. 8vo.

R. Univ., Upsala.

Ziervogel, Samuel. *Resp.* Rhabarbarum. See **Linné, C. von.** 1752.

Zimmermann, Albrecht. Die Morphologie und Physiologie des pflanzlichen Zellkernes. Jena, 1896. 8vo.

§ 2.—TRAVELS.

Beccari, Odoardo. Wanderings in the great forests of Borneo. Translated by E. H. GIGLIOLI and revised and edited by F. H. H. GUILLEMARD. London, 1904. 8vo.

Chevalier, Auguste. Mission Chari-Lac Ichad, 1902–1904. L'Afrique centrale française. Récit du voyage de la mission par A. C. Appendice : Diatomées . . . par Paul PETIT ; Questions agricoles and diverses par A. CHEVALIER et H. COURTET, etc. Paris, 1908. 8vo.

Author.

Fryer, John. A new account of East India and Persia, in eight letters : being nine years travels, begun 1672, and finished 1681. London, 1698. fol.

Gauharou, Léon. Géographie de la Nouvelle-Calédonie et dépendancies. Nouméa, 1882. 8vo.

W. Botting Hemsley.

Giglioli, Enrico Hillyer. See **Beccari, O.** 1904.

Guillemard, F. H. H. See **Beccari, O.** 1904.

Holton, Isaac F. New Granada : twenty months in the Andes. New York, 1857. 8vo.

Jourdier, Auguste. Voyage agronomique en Russie. Lettres et notes sur une excursion faite en 1859–1860. Ed. 2. Paris, 1861. 8vo. —— Lettres et notes sur une deuxième excursion faite en 1860–1861. Ib., 1863. 8vo.

Keller, Franz. The Amazon and Madeira Rivers. Sketches and descriptions from the note-book of an explorer. London, 1874. 4to.

Miss M. Smith.

Linné, Carl von. Resa till Lappland, 1732. See **Lundström, A. N.** 1878.

Lord, John Keast. The Naturalist in Vancouver Island and British Columbia. London, 1866. 8vo.

Lundström, Axel Nikolaus. Carl LINNÆI resa till Lappland, 1732. Upsala, 1878. 8vo.

R. Univ., Upsala.

Makepeace, Walter. See **Reith, G. M.**

Masson, Francis. An account of three journeys from the Cape Town into the southern parts of Africa. See Manuscripts.

Parry, William Edward. Journal of a voyage for the discovery of a north-west passage from the Atlantic to the Pacific . . . 1819–20, etc. London, 1821. 4to.

Spruce, Richard. Notes of a botanist on the Amazon & Andes . . . edited and condensed by A. R. WALLACE, with a biographical introduction, etc. London, 1908. 2 vols. 8vo.

Editor.

Thonner, Franz. Im afrikanischen Urwald : meine Reise nach dem Kongo und der Mongalla im Jahre 1896. Berlin, 1898. 8vo.

Author.

---

§ 3.—PERIODICALS.

Including the Publications of Societies.

Aberdeen. Agricultural Research Association. Report, 1905. [Including a report by T. JAMIESON on the utilisation of nitrogen in the air by plants, etc.] [Aberdeen, 1905 ?] 8vo.

Adelaide. Journal of Agriculture and Industry of South Australia. i–viii. Adelaide, 1897–1905. 8vo. *Continued as* Journal of the Department of Agriculture of South Australia. ix–xi. Adelaide, 1905–08 → 8vo.

Director of Agriculture.

Africa. British East Africa. Department of Agriculture. Annual report, 1907–08. (Nairobi, 1908.) 8vo.

Director.

Agricultural Research Association. See **Aberdeen.**

American Plants. Issued monthly by Charles Russell ORCUTT, editor. i. n. 10–12. San Diego, California, 1908. 8vo.

Annalen der Blumisterei für Blumenfreunde, Gartenbesitzer und Saamenhändler . . . herausg. durch J. E. von REIDER. i–xii. Nürnberg & Leipzig, 1825–36. 12 vols. 8vo.

Annales de flore et de pomone, ou journal des jardins. See **Journal et flore des jardins.**

Australia. South Australia. Department of Agriculture. See **Adelaide.**

Barbados. Imperial Department of Agriculture for the West Indies. Pamphlet series, n. 1–50. [Barbados] 1900–08 → Sm. 8vo.

Commissioner of Agriculture, West Indies.

Belgium. Vlaamsch Natuur- en Geneeskundig Congressen. Handelingen. ii. Gent, 1898. Ib., 1899. 4to. —— iii. Antwerpen, 1899. Ib., 1899. 4to. —— iv. Brussel, 1900. Gent & Antwerpen, 1900. 4to. —— ix. Aalst, 1905. Antwerpen & Brugge, 1906. 4to. —— x. i.–ii. Brugge, 1906. Antwerpen & Brugge, 1907. 4to. —— xi. Mechelen, 1907. Brugge, 1908. 8vo.

Secretary.

Besançon. Société d'Histoire naturelle du Doubs. [Extraits des procès-verbaux des séances, mémoires, etc.] n. 10–14. Besançon, 1905–08. 8vo.

Director, R.B.G. Kew.

British East Africa. Dep. Agric. See **Africa.** British East Africa.

British Guiana. Board of Agriculture. Journal, edited by A. W. BARTLETT. i. n. 1–3. Georgetown, 1907–08. 8vo.

Editor.

Christiania. Skandinaviske Naturforskeres. Forhandlinger, 4de Möde i Christiania den 11–18 Juli 1844. Christiania, 1847. 8vo.

J. N. F. Wille.

Dahlem. Königl. Gärtnerlehranstalt zu Dahlem bei Steglitz-Berlin (früher Wildpark). Bericht für die Jahre 1906 und 1907. Berlin, 1908. 8vo.

Doubs. Société d'Histoire naturelle. See **Besançon.**

Germany. Academia [Cæsarea Leopoldino-Carolina] Naturæ Curiosorum. Miscellanea curiosa medico-physica . . . sive Ephemeridium medico-physicarum . . . ann. ii. 1671. Jenæ, 1688. 4to. —— Ann. iii- x. 1672–79. Lipsiæ, Francofurti, etc., 1673–80. 5 vols. 4to. —— Dec. ii. ann. i–iv. vi–x. 1682–85, 1687–91. Norimbergæ, 1683–92. 9 vols. 4to. —— Dec. iii. ann. ii–x. 1694–1705. Lipsiæ, etc., 1695–1706. 6 vols. 4to. —— Index rerum . . . dec. i. et ii. 1670–92. Norimbergæ, 1695. 4to.

Graz. Botanisches Institut zu Graz. Mittheilungen, herausg. von H. LEITGEB. Heft 1 [— 2]. Jena, 1886–88. 8vo.

Handelingen van het ii^de^ [iii^de^–iv^de^ ; ix^de^–xi^de^] Vlaamsch Natuur-en Geneeskundig Congress. See **Belgium.**

Hastings and East Sussex Naturalist, being the journal of the Hastings and St. Leonards Natural History Society. i. n. 1–3. Hastings, 1906–1908 → 8vo.

Secretary.

Holmesdale Natural History Club, Reigate. Proceedings, 1865–67, 1872–85, 1888–1905. London, Reigate & Redhill, [1866]–1906. 8vo.

C. E. Salmon.

Indian Forest Memoirs. Chemistry Series, i. Pt. 1. Calcutta, 1908 → 4to. —— Forest Zoology Series, i. Pt. 1. Calcutta, 1908 → 4to.

Superintendent of Government Printing, Calcutta.

Indian Forest Records. i. Pt. 1–2. Calcutta, 1908 → 8vo.

Superintendent of Government Printing, Calcutta.

Irish Naturalist: a monthly journal of general Irish Natural History, edited by G. H. CARPENTER, R. Lloyd PRAEGER [and R. PATTERSON]. i–xv. Dublin, 1892–1908 → 8vo.

Jamaica. Board of Agriculture. Sugar Cane Experiment Station. Second report, 1906 and 1907, by H. H. Cousins. Kingston, 1908. 8vo.

Director of Agriculture, Jamaica.

Java. Proefstations voor Suikerriet in West- en Oost-Java. Handboek ten dienste van de Suikerriet-Cultuur en de Reitsuiker-Fabricage op Java. Derde deel. De Fabrikatie van Suiker uit Suikerriet op Java, door H. C. Prinsen GEERLIGS. Amsterdam, 1907. 8vo.

Director.

Journal et flore des jardins, par BOITARD, CAMUZET, CELS, etc. [i.] Paris, 1832. 8vo. [*Continued as*] Annales de flore et de pomone, ou journal des jardins, par CELS, DALBRET, DOVERGE, etc. 1832–42 [= 2e – 10e année]. Paris, 1833–42. 10 vols. 8vo.—2e série. 1e [– 3e] année, 1842–45. Paris, 1843–45. 3 vols. 8vo.

Bentham Trustees.

Journal of Agriculture and Industry of South Australia. See **Adelaide.**

Leaflets on [of] Philippine Botany, edited by A. D. E. ELMER, i. art. 1–16. Manila, 1906–08 → 8vo.

London. Imperial Institute. Bulletin, i–vi. (Issued as a quarterly supplement to the Board of Trade Journal.) London, 1903–08 → 8vo.

Director.

London. Pharmaceutical Society of Great Britain. Catalogue of the medicinal plants in the museum. See **Holmes, E. M.** 1896. §1.

London. Royal Society of London. History. See **Thomson, T.** §1.

London. Royal Society of London. Lists of candidates for election into the Royal Society, 1894, 1896–1899, 1901–07. (London, 1894–1907.) fol.

W. Botting Hemsley.

London. Royal Society of London. Some account of the 'Letters and Papers' in the Archives. See **Church, A. H.** §1.

Lyons. Société botanique de Lyon. Annales, i–xxxi. Lyon, 1873–1906. 31 vols. 8vo.

Bentham Trustees.

Lyons. Société botanique de Lyon. Bulletin, seconde série, i–xi. Lyon, 1883–93. 11 vols. 8vo.

Bentham Trustees.

Lyons. Société botanique de Lyon. Catalogue de la flore du bassin du Rhone (Ann. Soc. bot. Lyon, i–x.) Lyon, 1873–82. 8vo.

Bentham Trustees.

Magazine of Botany and Gardening . . . New series, vols. i–ii., edited by James BURNETT. London, 1835–36. 4to.

Mathematische und naturwissenschaftliche Berichte aus Ungarn. xii. 1 (1893–94); xiii. 1 (1895); xvii. (1899); xix. (1901.) (Botany only.) Berlin, Budapest & Leipzig, 1895–1904. 8vo.

Sir J. D. Hooker.

Melbourne. Department of Agriculture of Victoria. Journal, i–v. Melbourne, 1902–08→8vo.

Secretary.

Melbourne. Department of Agriculture of Victoria. Report, 1905–07. Melbourne, 1907. 8vo.

Secretary.

Mexico. Ministerio de Fomento de la Republica mexicana. Anales, i. México, 1877. 8vo.

W. Botting Hemsley.

Mexico. Rubber Planters' Association of Mexico. Year Book, 1907–08. Mexico, 1908. Sm. 4to.

P. Olsson-Seffer.

Miscellanea curiosa medico-phyica. See **Germany.** Acad. Nat. Cur.

Norwich. Norfolk and Norwich Naturalists' Society. Transactions, v–viii. (Botany only.) Norwich, 1890–1908→8vo.

Sir J. D. Hooker.

Philippine Agricultural Review. See **Philippine Islands.** Dep. Interior. Bur. Agric.

Philippine Islands. Department of the Interior. Bureau of Agriculture. The Philippine Agricultural Review, ed G. E. NESOM, i. n. 1–9. Manila, 1908→8vo.

Director, Bur. Agric.

Quarterly Journal of Forestry, edited by A. C. FORBES, i. n. 1, including Transactions of the Royal English Arboricultural Society [vi. Pt. 3.] London & Carlisle, 1907. 8vo.

Rome. R. Stazione chimico agraria sperimentale di Roma. Annali. Serie 2, i. 1906–07. Roma, 1907. 8vo.

Director.

Upsala. Naturvetenskapliga Studentsällskapet. Botaniska Sektionen. Sitzungsberichte, i–vii. 1886–92. (Bot. Centralbl. xxvi–lxiv.) Cassel, 1887–95. 8vo.

R. Univ., Upsala.

Victoria. Department of Agriculture. See **Melbourne.**

Wyoming. State Board of Horticulture. Publications. Special Bulletins, i. n. 1. Laramie, 1908. 8vo.

Secretary.

York. Yorkshire Philosophical Society. Catalogue of British plants in the herbarium. See **Wilkinson, H. J.** § 1.

York. Yorkshire Philosophical Society. Historical account of the herbarium. See **Wilkinson, H. J.** § 1.

Zeitschrift für Pflanzenkrankheiten . . . herausg. von P. SORAUER. Beigabe : Internationaler phytopathologischer Dienst. 1. Jahrg. Stuttgart, 1908 → 8vo.

---

§ 4.—MANUSCRIPTS.

Bentham, George. Letters to R. SPRUCE. See **Spruce, R.**

Bescherelle, Émile. Letters to R. SPRUCE. See **Spruce, R.**

Borrer, William. Letters from R. SPRUCE. See **Spruce, R.**

Christian, Frederick W. Plant-names of the north and south Marquesas Islands. 6 ff. fol.

Author.

Destruge, Alcides. Letters to R. SPRUCE. See **Spruce, R.**

Federated Malay States. Government Gardens and Plantations. Administration, economic plants, &c. Correspondence, with some printed matter (reports, &c.), 1882–1905. fol.

Hooker, Sir Joseph Dalton. Botanical sketch-book. 8vo.

Author.

Hooker, Sir J. D. Original testimonials in favour of J. D. HOOKER, R.N. as a candidate for the vacant chair of Botany in the University of Edinburgh, 1845. 4to.

Sir J. D. Hooker.

Hooker, Sir J. D. Tour in the United States of America in 1877. 4to.

Author.

Hooker, Sir William Jackson. Journal of a tour in Switzerland in 1814. fol.

Sir J. D. Hooker.

Hooker, Sir W. J. Diplomas granted to Sir W. J. HOOKER, with correspondence relating thereto. fol.

Sir J. D. Hooker.

Hooker, Sir W. J. Catalogue of the library of W. J. HOOKER, compiled at Halesworth about the year 1816. Sm. 4to.

Sir J. D. Hooker.

Hooker, Sir W. J. Catalogue of the library of W. J. HOOKER when it contained the books of his cousin and godfather, William JACKSON, compiled about the year 1828. Sm. fol. —— Another catalogue, with additions in the handwriting of D. OLIVER, bringing it down to the year 1863 or later. Vol. i. 4to.

Sir J. D. Hooker.

Hooker, Sir W. J. Letters to R. SPRUCE. See **Spruce, R.**

Jamaica. Botanical Department. Chiefly correspondence, 1881–1905. fol.

Jamaica. Botanic Gardens. Chiefly correspondence, 1856–1903. fol.

Masson, Francis. An account of three journeys from the Cape Town into the southern parts of Africa, etc. (A type-written abstract from Phil. Trans. R. Soc. Lond. lxvi. 1776, pp. 268–316.) 3 ff. 4to.

S. Mendelssohn.

Miers, John. Letters to R. SPRUCE. See **Spruce, R.**

Mitten, William. Letters to R. SPRUCE. See **Spruce, R.**

Nigeria. Royal Niger Company. Experimental plantations, gardeners, etc. Chiefly correspondence, 1858–90. fol.

Nyasaland. Botanic Station, etc. Chiefly correspondence, with some printed matter, 1878–1905. fol.

Nyasaland. Cultural products. Correspondence, memoranda, and some printed matter, 1877–1905. 2 vols. fol.

Spruce, Richard. Miscellaneous manuscripts. 2 vols. 8vo. and 1 vol. obl. 8vo. [*containing:* Journals, from Barra to the Orinoko, from Barra to Tarapoto, 1851–55, and from Tarapoto to Baños, 1857; Uses of Amazon plants; Musci et Hepaticæ amazonienses, 1–106; Musci

et Hepaticæ andenses, 107–279 ; Notes on the S. American Mosses in the herbarium of Dr. Thos. TAYLOR ; Notes on Mosses in the herbarium of LINNÆUS and of Sir J. E. SMITH ; Notes on the Mosses of his own herbarium, 421–790, etc.]

R. Spruce's Executor.

Spruce, Richard. Correspondence. 1 vol. 4to. (*Includes* 66 letters to W. BORRER, 1842–48 ; 35 from Sir W. J. HOOKER, 1848–65 ; 40 from G. BENTHAM, 1850–62 ; 12 from W. MITTEN, 1852–70 ; 5 from A. DESTRUGE, 1871–82 ; 2 from J. MIERS, 1873–74 ; 15 from E. BESCHERELLE, 1886–90, with some draft letters in reply.)

A. R. Wallace (letters to Borrer) and R. Spruce's Executor.

Spruce, Richard. Notes for an introduction to his "Hepaticæ amazonicæ et andinæ." 17 ff. 8vo.

R. Spruce's Executor.

Spruce, Richard. Plantæ amazonicæ, 267–3846. [Descriptive catalogue.] 2 vols. 8vo.

R. Spruce's Executor.

Spruce, Richard. Plantæ andinæ, 3851–6551, 6576–6580. [Descriptive catalogue.] 2 vols. 8vo.

R. Spruce's Executor.

Trinidad. Botanic Garden. Chiefly correspondence, 1872–1905. 2 vols. fol.

Uganda. Botanic Garden. Chiefly correspondence, 1898–1905. fol.

Uganda. Cultural products. Chiefly correspondence, 1881–1905. fol.

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

APPENDIX III.—1909.

NEW GARDEN PLANTS OF THE YEAR 1908.

The number of garden plants annually described in botanical and horticultural publications, both English and foreign, is now so considerable that it has been thought desirable to publish a complete list of them in the *Kew Bulletin* each year. The following list comprises all the new introductions recorded during 1908. These lists are indispensable to the maintenance of a correct nomenclature, especially in the smaller botanical establishments in correspondence with Kew, which are, as a rule, only scantily provided with horticultural periodicals. Such a list will also afford information respecting new plants under cultivation at this establishment, many of which will be distributed from it in the regular course of exchange with other botanic gardens.

The present list includes not only plants brought into cultivation for the first time during 1908, but the most noteworthy of those which have been re-introduced after being lost from cultivation. Other plants included in the list may have been in gardens for several years, but either were not described or their names had not been authenticated until recently.

In addition to species and well-marked varieties, hybrids, whether introduced or of garden origin, have been included where they have been described with formal botanical names. Mere cultural forms of well-known garden plants are omitted, for obvious reasons.

In every case the plant is cited under its published name, although some of the names are doubtfully correct. Where, however, a correction has appeared desirable, this is made.

The name of the person in whose collection the plant was first noticed or described is given where known.

An asterisk is prefixed to all those plants of which examples are in cultivation at Kew.

The publications from which this list is compiled, with the abbreviations used to indicate them, are as follows:—*B. H. B.*—Bulletin de l'Herbier Boissier. *B. K.*—Guerke, Blühende Kakteen. *B. M.*—Botanical Magazine. *B. M. H. N.*—Bulletin du Muséum d'Histoire Naturelle, Paris. *B. S. B. F.*—Bulletin de la Société Botanique de France. *B. S. D. F.*—Bulletin de la Société Dendro-

(13127—6a.) Wt 108—471. 1375. 5/09. D & S.

logique de France. *B. T. O.*—Bullettino della R. Società Toscana di Orticultura. *Gard.*—The Garden. *G. C.*—Gardeners' Chronicle. *Gfl.*—Gartenflora. *G. M.*—Gardeners' Magazine. *G. W.*—Gardening World. *I. S. H. T.*—Icones Selectae Horti Thenensis. *Jard.*—Le Jardin. *J. of H.*—Journal of Horticulture. *J. H. F.*—Journal de la Société Nationale d'Horticulture de France. *J. R. H. S.*—Journal of the Royal Horticultural Society. *K. B.*—Bulletin of Miscellaneous Information, Royal Botanic Gardens, Kew. *Lemoine Cat.*—Lemoine, Catalogue. *M. D. G.*—Mitteilungen der Deutschen Dendrologischen Gesellschaft. *M. K.*—Monatsschrift für Kakteenkunde. *N. B.*—Notizblatt des Königl. botanischen Gartens und Museums zu Berlin. *N. B. G. Edinb.*—Notes from the Royal Botanic Garden, Edinburgh. *O. G. Z.*—Oesterreichische Garten-Zeitung. *O. R.*—Orchid Review. *Orch.*—Orchis. *R. H.*—Revue Horticole. *R. H. B.*—Revue de l'Horticulture Belge. *Sargent, T. & S.*—Sargent, Trees and Shrubs. *S. M. C.*—Smithsonian Miscellaneous Collections. *Späth Cat.*—L. Späth, General Nursery Catalogue. *T. H.*—La Tribune Horticole. *Veitch Nov.*—J. Veitch & Sons, List of Novelties. *Vilm. Nov.*—Vilmorin-Andrieux & Cie., List of Novelties.

The abbreviations in the descriptions of the plants are :—*diam.*—Diameter. *ft.*—Foot or Feet. *G.*—Greenhouse. *H.*—Hardy. *H. H.*—Half-hardy. *in.*—Inches. *S.*—Stove.

Acanthaceae. An annotated list of the Acanthaceae known to have been in cultivation is given by R. H. Beddome in *J. R. H. S.* xxxiv. 54–96.

Acer discolor. (*Späth Cat.* 1908–9, n. 130, 75.) Sapindaceae. H. A tree 30–40 ft. high, with broadly lanceolate leaves which are dark green above and bluish white beneath. China. (L. Späth, Berlin.)

Acer obtusatum Murbecki. (*M.D.G.* 1907, 255.) H. Leaves 3-lobed. (Lund B.G.)

Acer spicatum laciniatum. (*M.D.G.* 1907, 257.) H. Somewhat weaker in growth than the type, with smaller irregularly lobed and laciniate leaves. (Simon-Louis, Plantières, Metz.)

***Achillea Huteri.** (*G. W.* 1908, 557, f.) Compositae. H. Stems about 6 in. high. Leaves silvery grey, small, deeply divided into linear segments. Flower-heads in corymb-like clusters terminating the stems, rather larger and more showy than those of *A. umbellata* to which the species is allied. Switzerland. (Kew.)

Aconitum volubile latisectum. (*Vilm. Nov.* 1908–9, ix.; *G. C.* 1908, xliii. 218; *R. H.* 1908, 169.) Ranunculaceae. H. A climber attaining a height of 6–7 ft., with elegantly cut dark green leaves and large trusses of deep blue flowers. China. (Vilmorin-Andrieux & Co., Paris.)

Ailanthus glandulosa tricolor. (*M. D. G.* 1907, 255.) Simarubaceae. H. Leaves when young blotched with rose, afterwards with pure white. (Fritz Graf v. Schwerin, Wendisch-Wilmersdorf, Germany.)

Akebia lobata var. **australis.** (*M. D. G.* 1907, 65.) Berberidaceae. H. Leaves always trifoliolate, with large leathery fresh green leaflets. China. (C. Sprenger, Vomero, Naples.)

Alnus Spaethii. (*Späth. Cat.* 1908–9, n. 130, 79.) Betulaceae. H. A garden hybrid between *A. japonica* and *A. subcordata.* (L. Späth, Berlin.)

Alocasia Desmetiana. (*Gfl.* 1908, 405.) Araceae. S. Leaves elongated heart-shaped, deeply sinuate; petiole spotted. Native country not recorded. (De Reusse, Saffelaere, Belgium.)

Alsophila incana. (*R. H. B.* 1906, 242; 1907, 377; 1908, 172, 179, f.) Filices. S. Referred to as a superb arborescent Fern with black spiny petioles. Congo. (E. Pynaert-Van Geert, Ghent.)

Amorpha fruticosa aureo-variegata. (*M. D. G.* 1907, 255.) Leguminosae. H. Leaves partly blotched with golden-yellow, but this coloration is not constant. (Fritz Graf v. Schwerin, Wendisch - Wilmersdorf, Germany.)

*Anchusa capensis alba. (*Gfl.* 1908, 618.) Boraginaceae. H. A variety with white flowers. S. Africa. (Ver. z. Beförderung des Gartenb., Berlin.)

Androsace Bulleyana. (*N. B. G. Edinb.* iv. 233, t. 43A.) Primulaceae. H. A biennial with thick woody roots. Leaves in a dense rosette, sessile, spathulate, ½–1¼ in. long, ⅓ in. broad at the apex, glaucous, ciliate, mucronate. Scapes numerous, erect, strong, 2–5 in. long, pubescent, bearing densely pubescent 5–12-flowered umbels. Corolla salver-shaped, cinnabar-red; tube with a prominent annulus at the throat; limb 3–5 lin. across. S. W. China. (A. K. Bulley; Edinburgh B. G.) [*A. coccinea*, Franch.]

*Angraecum Augusti. (*O. R.* 1908, 246.) Orchidaceae. S. A new species allied to *A. Kotschyanum*. Leaves thick and fleshy, distinctly glaucous green. Flowers pure white, arranged in two rows in an arched raceme; spur pale green, flexuose, slender, about 6 in. long. N.E. Rhodesia. (Sir Trevor Lawrence.) [Syn. *A. Augustum*: G. C. 1908, xliv. 76; 1909, xlv. 89, f.; G. M. 1908, 588.]

*Anisotes diversifolius. (*B. M.* t. 8219.) Acanthaceae. G. An erect glabrescent shrub about 1½ ft. high. Leaves elliptic-ovate or obovate, ¾–1¾ in. long, ½–1 in. broad. Flowers pendulous, in short few-flowered axillary cymes. Corolla flame-coloured or yellow, 1½–2 in. long, with a narrow cylindric tube and two conspicuous lips, the upper slightly curved and the lower revolute. Socotra. (Kew.)

Anthemis floribunda. (*R. H.* 1908, 366.) Compositae. H. A dwarf plant, 10–12 in. high, with delicate much dissected leaves and pure white flower-heads. Country not stated.

Anthurium Laucheanum. (*G. C.* 1908, xliii. 258, f. 112; *R. H.* 1908, 229; *R. H. B.* 1908, 193; *Gfl.* 1908, 325.) Araceae. S. Stem elongated, apparently climbing by means of aerial roots. Leaves oblong-cordate, 12–15 in. long, 6–9 in. broad, conspicuously reticulate or almost bullate; petioles long, smooth, rounded. Colombia. (F. Sander & Sons). [This name has been previously given to another species of *Anthurium*, which is distinct from the plant here described.]

Anthurium Sanderi. (*G. C.* 1908, xliii. 258, suppl. ill. May 2; *R. H.* 1908, 229; *R. H. B.* 1908, 194, f.; *Gfl.* 1908, 325.) S. Resembles *A. crystallinum* and *A. magnificum*. Stem short, stout, with symmetrically arranged leaves. Leaves cordate, 3 ft. long, 2 ft. broad, with a broad sinus and sinuate lobes, olive-green above, with silvery white irregular bands along the midrib and lateral nerves, pale green beneath; petiole 3 ft. long, conspicuously angled and winged. Colombia? (F. Sander & Sons.)

Anthurium Scherzeri-Andreanum. (*R. H. B.* 1908, 196, 253, f.) S. A hybrid between *A. Scherzerianum* and *A. Andreanum*. (L. De Smet-Duvivier, Mont St. Amand, Ghent.)

Anthurium Scherzerianum rotundispathum. (*R. H.* 1908, 496, t.) S. Spathe rounded and very large, white on the upper side, with numerous small dark rose spots, bright red on the under side and slightly spotted with white; spadix curled. (R. Jarry-Desloges, Remilly, Ardennes, France.)

*Aphelandra Macleayi. (*J. R. H. S.* xxxiv. 59.) Acanthaceae. S. Glabrous. Leaves ovate-elliptic, 1–3 in. long, green on both sides, with a white band down the midrib above, gradually acute, entire, shortly petiolate. Flowers in a terminal cone-like spike 1½–2 in. long. Corolla orange-scarlet, nearly 2 in. long. A new species. In cultivation a long time ago as *A. punctata*, and sometimes met with as *A. squarrosa*. Country unknown. (R. H. Beddome.)

Ardisia crenulata foliis variegatis. (*Jard.* 1908, 153.) Myrsinaceae. G. A form with variegated leaves. See *G. C.* 1908, xliii. 284. (L. De Smet-Duvivier, Mont St. Amand, Ghent.) [*Ardisia crenata foliis variegatis.*]

Asparagus elongatus. (*J. of H.* 1908, lvi. 193.) Liliaceae. G. A free-growing beautiful plant, with stems reaching a height of 6–7 ft., the branches bearing very numerous small flowers. Africa. (W. A. Manda, South Orange, New Jersey.)

Asparagus filicinus var. Giraldii. (*G. C.* 1908, xliv. 122, f. 48.) G. A variety with large broad glossy green phylloclades, usually borne in groups of 5. Flowers solitary, green, on slender pedicels much longer than the phylloclades; buds brownish. China. (Sir Trevor Lawrence.)

Aspidium falcatum var. Mayi. (*J. of H.* 1908, lvi. 362.) Filices. G. A crested form. The fronds are rather more stiff and less arching than in the type; at the ends they are broader and prettily crested. (H. B. May &

Sons.) [Syn. *Cyrtomium falcatum* var. *Mayi*; G. C. 1908, xliii. 254; G. 1908, 226; G. M. 1908, 322, f. *Polystichum falcatum* var. *Mayi*; G. C. 1908, xliii. 313, f. 141.]

Asplenium Laurentii var. **denticulatum.** (*T. H.* 1908, 221, t.) Filices. S. Nearest to *A. macrophyllum*, but smaller. Stipes 3¼ in. long. Fronds about 5½ in. long and 2 in. broad, with 5 obovate-triangular pinnae each side, which resemble the leaves of *Ginkgo biloba*. The variety differs from the type in having the pinnae deeply and sharply toothed along the broad apical margin. See *B. H. B.* 1896, 663. Congo. (Laeken Colonial G.; Brussels B. G.; both type and var.)

***Aster puniceus pulcherrimus.** (*Gfl.* 1908, 579.) Compositae. H. Flower-heads large, white, tinted with pale blue.

Astilbe Arendsii. (*G. C.* 1908, xliv. 75; *O. G. Z.* 1908, 384.) Saxifragaceae. H. This name has been given to a number of hybrids obtained by crossing *A. Davidii* with *A. astilboides* and *A. japonica compacta*. (G. Arends, Ronsdorf, Germany.)

Astilbe virescens. (*K.B.* 1908, 16.) H. A new species resembling *A. rivularis*. Leaves biternate; leaflets obliquely cordate, about 4 in. long, 2½–5¾ in. broad, acutely acuminate, crenate. Panicles very much branched, pyramidal. Flowers pedicellate, small, green, hermaphrodite. Petals wanting. Stamens 10. China. (J. Veitch & Sons.)

Azalea ledifolia var. **Van-Noordtiana.** (*Gfl.* 1908, 139, 389.) Ericaceae. H. More hardy than the type, with larger leaves differing in colour and in their glands and pubescence, and with larger differently-shaped flowers. (Van der Noordt & Sons, Boskoop, Holland.) [*Rhododendron ledifolium* var.]

***Azalea occidentalis graciosa.** (*G. C.* 1908, xliii. 358; *G. M.* 1908, 440; *R. H.* 1908, 312.) H. A very free-flowering variety, with large clusters of fragrant white flowers marked on the 2 upper lobes of the corolla with yellow. (R. & G. Cuthbert.) [*Rhododendron occidentale* var.]

Azalea occidentalis magnifica. (*G. C.* 1908, xliii. 355.) H. Flowers fragrant, white except the upper lobe of the corolla, which is marked with yellow. (R. & G. Cuthbert.) [*Rhododendron occidentale* var.]

Azalea Vuylstekeana. (*R. H. B.* 1908, 97, t., as *A. indica Vuylstekeana*.) G. Flowers crimson, semi-double. A hybrid between garden forms of *Rhododendron indicum*. (C. Vuylsteke, Loochristi, Ghent.)

Azaleodendron Crouxii. *See* **Rhodazalea Crouxii.**

***Begonia cathayana.** (*B. M.* t. 8202.) Begoniaceae. S. A new species similar to *B. Bowringiana* and *B. laciniata*. Herb 2–3 ft. high, with fleshy stems and leaves, clothed with long crimson soft hairs. Leaves obliquely cordate, up to 10 in. long, green above except the crimson nerves, with a paler zone, crimson below; petioles 6–8 in. long. Flowers coarsely hairy, vermilion, 1½–1¾ in. across, the male with 4 and the female with 5 segments. China. (F. Sander & Sons.) [*B. Bowringiana*, Hort.; G. C. 1903, xxxiii. 245, suppl. f., not of Champ.]

Begonia hybrida Elsmeri. (*G. C.* 1908, xliii, 301.) G. Parents not stated. It is a vigorous winter-flowering plant, with large fresh-coloured stellate flowers.

***Begonia kewensis.** (*G. C.* 1908, xliv. 75; *Gard.* 1908, 379, 435; *G. W.* 1908, 538; *J. of H.* 1908, lvii. 87.) G. Of garden origin. It is a slender-growing plant, with horizontal or pendulous leafy branches. Leaves oval or oblong, oblique, acute, about 6 in. long, 2 in. broad at the base. Flowers pure white or pale cream-coloured, ½ in. across, borne in large clusters along the branches. (Kew; J. Veitch & Sons.)

***Begonia modica.** (*K. B.* 1908, 259.) S. A very small almost stemless herb. Leaves obliquely and broadly peltate-ovate, 2–3¼ in. long, 1¾–2½ in. broad, subacute, light green except the obscurely reddish margins; petiole 1¼–1¾ in. long. Peduncles few-flowered, ¾–1¼ in. long. Flowers terminal, yellow, about ¾ in. across, the 2 male on pedicels about ¾ in. long and the 1 female almost sessile, each with only 2 segments. West Trop. Africa. (Kew.)

***Beloperone angustiflora.** (*K. B.* 1908, 20; *J. R. H. S.* xxxiv. 64.) Acanthaceae. S. A perennial dichotomously branched herb. Leaves oblong-elliptic or the upper narrowly oblong or almost linear, 1¼–3 in. long, 3–8 lin. broad, acute at apex and base, entire. Inflorescence at first subcapitate, afterwards elongated, dense. Corolla-tube narrow, whitish, 6–7 lin. long; limb purple-violet, 2-lipped;

upper lip 2-lobed, about 2 lin. long; lower lip deeply 3-lobed, about 3 lin. long. Tropical America. (Kew; Paris B. G.)

Berberis arguta. *See* **Mahonia arguta.**

***Berberis yunnanensis.** (*B. M.* t. 8224.) Berberidaceae. H. A shrub 3–6 ft. high; branches greyish, with spreading 3- or 5-partite spines. Leaves obovate-cuneate, ¾–1½ in. long, ⅓–⅔ in. broad, rounded at the apex, entire or spinose-serrate. Flowers solitary or in few-flowered fascicles, pale yellow, ¾ in. across. Berries red, ellipsoid, ⅓–½ in. long. Western China. (M. L. de Vilmorin, Les Barres, France.)

***Betula globispica.** (*M. D. G.* 1907, 61, 66.) Betulaceae. H. Closely resembles *Carpinus yedoensis*, from which it is easily distinguished by having brown somewhat acute leaf-buds. Japan. (Darmstadt B. G.; C. Sprenger, Vomero, Naples.)

***Bifrenaria tetragona.** (*G. C.* 1908, xliii. 422; *O. R.* 1908, 205.) Orchidaceae. G. Flowers closely arranged around the pseudobulbs, wax-like, with greenish sepals and petals, and a white lip suffused with dark purple outside. Brazil. (Charlesworth & Co.) [*Maxillaria tetragona*, Lindl.; B. M. t. 3146. = *Lycaste tetragona*, Lindl.; Gard. 1908, 323.]

Brassica insularis. (*G. C.* 1908, xliv. 81.) Cruciferae. H. A robust very free-flowering species. Leaves rather thick, glaucous, the lower petiolate, lyrate, unequally crenate-dentate or almost entire, the upper subsessile, long-linear. Racemes stout. Flowers relatively large, white, or white with red veins. Sardinia. (La Mortola.)

Brasso-cattleya Cliftoni. (*G. C.* 1908, xliv. 418; *G. M.* 1908, 943, 944, f.; *J. of H.* 1908, lvii. 574.) Orchidaceae. S. A garden hybrid between *B.-c. Digbyano-Mossiae* and a variety of *Cattleya Trianae*. (Charlesworth & Co.)

Brasso-cattleya Peetersiae. (*O. R.* 1908, 150.) S. A garden hybrid between *Cattleya Warscewiczii* and *B.-c.* Madame Ch. Maron. (F. Lambeau, Brussels.)

Bromelia tricolor. (*G. C.* 1908, xliii. 257, f. 115; *R. H.* 1908, 229; *R. H. B.* 1908, 192; *Gfl.* 1908, 325.) Bromeliaceae. S. Resembles *Ananas sativus variegatus*, but it differs in habit, and the leaves have larger hooked marginal spines ¼ in. apart or more. Leaves 2 ft. long, 1½–2 in. broad, wavy on the margins, with broad marginal bands of creamy yellow, or rose-red at the base, and entirely rose-red when young. South Brazil. F. Sander & Sons.)

***Bromheadia Finlaysoniana.** (*O. R.* 1908, 200.) Orchidaceae. S. Similar to *Epidendrum elongatum* in habit, varying from 1-8 ft. in height. Inflorescence flexuose, continuing to elongate and flower for a long time. Flowers in the axils of cup-shaped bracts closely arranged in two rows, white faintly tinged with pink, yellow on the disk of the lip and purple-veined on the side lobes; segments about 1½ in. long. Reintroduced. Malay Peninsula and Archipelago. (Kew.) [Syn. *B. palustris*, Lindl.; B. M. t. 4001.]

***Buddleia variabilis** var. **superba.** (*Veitch, Nov.* 1908–9, 4, f.) Loganiacae. H. Spikes of flowers much larger and more deeply coloured than in any other variety. It flowers a fortnight later than the type. (J. Veitch & Sons.)

Bulbophyllum Dixoni. (*K. B.* 1908, 412.) Orchidaceae. S. A new species near *B. Pechei*, but it has a larger scape, and the small flowers are light greenish yellow, with numerous more or less confluent dark brown spots on the sepals, and a dusky brown lip with a yellow median line. Scape 6–7½ in. long. Sepals about ⅓ in. long. Petals ⅓ in. long, with bristle-like tails at the apex. Siam. (Trinity Coll. *B. G.*, Dublin.)

***Bulbophyllum fascinator.** (*B. M.* t. 8199.) S. An epiphyte with stout creeping rhizome. Pseudobulbs ovoid-oblong, ¾–1 in. long, 1-leaved. Leaves sessile, elliptic-oblong, about 2 in. long and 1 in. broad. Scape about 4 in. long, 1-flowered. Flowers large, pale green with crimson markings. Dorsal sepal ovate, about 1¼ in. long, with crimson filiform appendages at the apex; lateral sepals united and prolonged into caudate appendages about 7 in. long. Petals falcate-oblong, nearly ½ in long. Lip recurved, ovate-oblong, channelled. Annam. (F. Sander & Sons.) [Syn. *Cirrhopetalum fascinator*, Rolfe; K. B. 1908, 69.]

***Bulbophyllum lilacinum.** (*G. C.* 1908, xliv. 348; *O. R.* 1908, 362; *J. of H.* 1908, lvii. 482.) S. Flowers in dense racemes or spikes, about 3 in. long, lilac spotted with purple. Siam. (Sir Trevor Lawrence.)

Bulbophyllum mirum. (*O. R.* 1908, 190: *G. C.* 1908, xliii. 353, f. 156; *G. M.* 1908, 440.) S. Remarkable for its curious flowers. Plant about 3 in. high, with ribbed pseudobulbs. Leaves oblong, short. Scapes 2-flowered. Flowers whitish or buff, densely spotted with light reddish brown. Lateral sepals united, about twice as long as the ovate connivent dorsal one. Petals consisting of a small round disk, with 15–17 linear motile filaments on the back. Malaya. (Sir. J. Colman.) [Syn. *B. vibrans*; Gard. 1908, 274.]

Bulbophyllum morphologorum. (*Orch.* ii. 89, f.) S. Allied to *B. Careyanum*, but the peduncles are 10 in. long. Spikes 4–5 in. long, densely flowered. Flowers very small, greenish yellow, very densely spotted with sordid purple; lip yellow, with a black scurf on the upper side. The flowers are curious in having a small triangular plate between the dorsal and lateral sepals. Siam. (Baron von Fuerstenberg, Hugenpoet, Mintard, Germany.)

Bulbophyllum propinquum. (*Orch.* ii. 62.) S. Pseudobulbs ovoid or the older 4-winged, $\frac{1}{2}$–$\frac{3}{4}$ in. long, 1-leaved. Leaves oblong-lanceolatae, acute, $2\frac{1}{4}$–$4\frac{1}{2}$ in. long, $\frac{1}{2}$–$\frac{3}{4}$ in. broad. Racemes shorter than the pseudobulbs and leaves together, many-flowered. Flowers about $\frac{1}{3}$ in. long, green, with a dense purple reticulation, yellow on the disk and minute petals. Siam. (Baron von. Fuerstenberg.)

Bulbophyllum vibrans. *See* **B. mirum.**

Buxus sempervirens var. **himalayensis.** (*M. D. G.* 1907, 66.) Euphorbiaceae. H. Leaves $1\frac{3}{4}$–2 in. long, nearly $\frac{1}{2}$ in. broad, resembling those of the Myrtle. Himalaya. (C. Sprenger, Vomero, Naples.)

***Calandrinia chromantha.** (*Gfl.* 1908, 632.) Portulaceae. H. Plant about 1 ft. high, freely and loosely branched. Leaves rather large, sap-green. Buds and flowers rose-coloured, followed by small orange-yellow fruits which persist a long time. Argentina. (M. Herb, Naples.)

Calathea insignis. (*G.C.* 1908, xliv. 63.) Scitamineae. S. Leaves partially erect, lanceolate, 15 in. long, 2 in. broad at their broadest part, light green above, deeply shaded on the margins and marked with dark velvety blotches on each side of the midrib, rich purple beneath. Brazil? (J. Veitch & Sons.)

***Campanula glomerata acaulis.** (*R. H. B.* 1908, 329, f.; *Jard.* 1908, 122, f.) Campanulaceae. H. A dwarf form, the stems being only 3–5 in. high. (Cayeux & Le Clerc, Paris.)

***Carpinus yedoensis.** (*M. D. G.* 1907, 66.) Cupuliferae. H. A quick-growing tree, with a valuable wood. Leaf-buds green. Leaves large, quite glabrous, prettily and irregularly toothed, sometimes even lobed. Japan; Central China. (C. Sprenger, Vomero, Naples.)

Catasetum Claesianum. (*G.C.* 1908, xliv. 150, 211, f. 90; *O. R.* 1908, 276; *J. of H.* 1908, lvii. 185.) Orchidaceae. S. Closely allied to *C. discolor*. Flowers in an erect spike, greenish yellow, about $\frac{1}{2}$ in. across, with the lip fringed along the sides. Antennae commonly present in the species of this genus wanting. Introduced into Belgium in 1892. Brazil. (Sir Trevor Lawrence.)

***Catasetum labiatum.** (*G. C.* 1908, xliv. 150; *O. R.* 1908, 276; *J. of H.* 1908, lvii. 185.) S. Leaves oblong-lanceolate, 7–11 in. long, $1\frac{1}{2}$–2 in. broad. Scapes $1\frac{1}{2}$ ft. long, the male about 10-flowered, the female 2-flowered. Flowers green or olive-green; male subglobose, about 1 in. long, with the lip slightly longer than the other segments; female with spreading sepals and petals, up to $\frac{3}{4}$ in. long, and a fleshy hooded lip slightly longer. See *Hook. Ic. Pl.* t. 2617. Organ Mountains, Brazil. (Sir Trevor Lawrence.)

***Catasetum spinosum.** (*O. R.* 1908, 252.) S. Pseudobulbs oblong, striated. Scape about a foot high, erect, bearing a raceme of many slightly fragrant flowers. Sepals linear-lanceolate, spreading, pale yellowish green, with blood-red patches. Petals similar in shape, connivent over the back of the column. Lip spreading, linear, fringed with white flexuose succulent hairs, greenish white beneath, dotted with red, bearing on the upper side at the base an erect 3-partite spine, and a much larger one below the acumen. Reintroduced. Brazil. (Kew.) [Syn. *Myanthus spinosus*, Hook.; B. M. t. 3802.]

Cattleya Dietrichiana. (*R. H. B.* 1908, 282, 283.) Orchidaceae. G. A garden hybrid between *C. Schilleriana* and *C. Hardyana*. (E. Praet.)

Cattleya Dupreana. (*G. C.* 1908, xliv. 36; *O. R.* 1908, 245.) G. A garden hybrid between *C. Warneri* and *C. Warscewiczii*. (A. A. Peeters, Brussels.)

Cattleya Hardyana var. aurea. (*J. H. F.* 1907, 569.) G. Distinguished by its deeper yellow lip. (F. Lambeau, Brussels.)

Cattleya intermedio-aurea. (*Orch.* ii. 100.) G. A garden hybrid between *C. intermedia* and *C. aurea.* (P. Wolter, Madgeburg, Germany.)

Cattleya labiata Beranekiana. (*R. H.* 1908, 515.) G. Flowers white, with a slightly rose-coloured lip. (O. Béranek, Paris.)

Cattleya Mendelii majestica. (*O. R.* 1908, 205.) G. Flowers large, white, tinged with lavender on the petals, the front lobe of the lip rosy mauve. (F. Wellesley.)

Cattleya Mossiae Goosensiana. *G. C.* 1908, xliii. 321; *G. M.* 1908, 392.) G. Sepals and petals pearly white. Lip deep reddish violet or violet-purple, with a white crimped margin. (Sir Trevor Lawrence.)

Cattleya parisiensis. (*G. C.* 1908, xliii. 158.) G. A garden hybrid between *C. aurea* and *C. Parthenia.* (F. Wellesley.)

***Cercis canadensis f. alba.** (*M.D.G.* 1907, 72.) Leguminosae. H. A white-flowered form. (Arnold Arboretum.)

Cereus Anisitsii. (*B. K.* t. 107.) Cactaceae. S. Stem very slightly 4-angled. Areolae with 3, rarely 4 or more, radial spines only 1-2 lin. long. Flowers 7-8 in. long, almost odourless; tube long, slender; segments lanceolate, acuminate, purplish, especially the outer, passing to white on the inside. Style shining carmine-red. Paraguay. (Berlin-Dahlem B.G.)

Cereus Dybowskii. (*B. S. B. F.* 1908, 695.) S. Branched from the base. Branches erect, nearly 17 ft. long. Ribs 28–30, low, hidden by a white wool. Areolae approximate. Radial spines 20–25 or more, bristle-like, intertwined; central numerous, somewhat stronger. Flowers funnel-shaped, white, 10 in. long. Fruit red, naked, with white pulp. Brazil. (Dép. Agric. Col., Paris.)

Cereus tricostatus. (*B. S. B. F.* 1907, 664; *M. K.* 1908, 167.) S. Very near *C. triangularis*, differing in having only 1 or 2 short spines to each of the areolae, and somewhat smaller red fruits, with scarlet instead of white flesh. Mexico.

Chenopodium amaranticolor. (*R. H.* 1908, 77; *O. G. Z.* 1908, 164.) Chenopodiaceae. H. Annual herb attaining a height of 8 ft., with a robust branched glabrous stem, alternately striped with white and amaranth-red. Leaves varying in shape from triangular to rhomboidal, up to 4 in. long, covered when young with an amaranth-red dust which disappears with age; petiole 2–3 in. long. Flowers in a long amaranth-red panicle. Southern France? (Paris B.G.)

***Chirita barbata.** (*B. M.* t. 8200.) Gesneraceae. S. A perennial herb with an erect stem 2 ft. high. Leaves ovate-oblong, 3–6 in. long, 1–2½ in. broad, hairy on both sides; petioles ½–1 in. long. Peduncles united to the petioles. Flowers pedicellate, 4–8 together. Corolla funnel-shaped, bluish lilac, with a yellow band in front; tube 1 in. long or more; lobes rounded, slightly spreading. This plant was included in List of 1896 as *C. hamosa*, but it differs from *C. hamosa*, R. Br., in the leaves, the size and shape of the calyx and corolla, and in the woolly anthers. India. (Kew.)

Chondropetalum Fletcheri. (*G. C.* 1908, xliv. 347; *O. R.* 1908, 56, f. 8.) Orchidaceae. S. A garden hybrid between *Chondrorhyncha Chestertoni* and *Zygopetalum Mackayi.* (J. C. B. Fletcher.)

Cirrhopetalum Andersonii. (*G. C.* 1908, xliv. 254.) Orchidaceae. S. Plant of dwarf habit. Flowers 1 in. long, in umbels. Lateral sepals ovate, connivent, whitish, with fine rose dots; dorsal sepal concave, marked with purple lines. Sikkim. (Sir Trevor Lawrence.)

Cirrhopetalum fascinator. *See* **Bulbophyllum fascinator.**

***Cirrhopetalum papillosum.** (*K. B.* 1908, 70.) S. Rhizome short. Pseudobulbs narrowly elliptic-oblong, ¾ in. long, 1-leaved. Leaves narrowly oblong, about 1¾ in. long, ¼–⅓ in. broad. Scapes slender, about 2 in. long. Umbels usually 6-flowered. Flowers about 1 in. long. Dorsal sepal and petals lined with dark purple on a pale ground; lateral sepals papillose-hispid, marbled and speckled with red-brown. Siam. (Trinity Coll. B.G., Dublin.)

***Cirrhopetalum Roxburghii.** (*G. C.* 1908, xliii. 290; *O. R.* 1908, 170; *Gard.* 1908, 222.) S. Small plant, with ovate dull reddish green leaves and almost globose umbels of cream-white flowers tinged with rose or purple. India. (Sir Trevor Lawrence.)

Cladrastis tinctoria aureo-variegata. (*M. D. G.* 1907, 255.) Leguminosae. H. Leaves constantly variegated with yellow. (Simon-Louis, Plantières, Metz.)

***Clematis repens.** (*Veitch, Nov.* 1908–9, 4, 11, f.) Ranunculaceae. H. Similar to *C. montana*, but the pure white flowers are much larger, being 2-3 in. across, and they are produced in August. China. (J. Veitch & Sons.)

Clethra alnifolia f. **rosea.** (*M. D. G.* 1907, 75.) Ericaceae. H. Corolla, especially outside, rose, white towards the base, bright rose in bud. Massachusetts. (Arnold Arboretum.)

***Cocos nucifera** var. **aurea.** (*G. C.* 1908, xliii. 257, f. 123; *Jard.* 1908, 152; *R. H. B.* 1908, 193.) Palmae. S. Remarkable on account of the orange-yellow sheaths, petioles, and midribs of the leaves. (F. Sander & Sons.)

Codonanthe florida. (*B. T. O.* 1908, 8, f. 1.) Gesneraceae. S. Branches slender, trailing, rooting, brown, rarely again branched. Leaves petiolate, oblong-elliptic, 1 in. long, nearly ½ in. broad, fleshy, more or less incurved at the apex, pale green beneath, darker green above. Flowers solitary, axillary. Pedicels and calyx-tube red-brown. Calyx-lobes linear, erect, green. Corolla about ¾ in. long, at first quite white, afterwards pale brownish yellow, which is more pronounced inside the tube, the throat of which is densely spotted with dark brown; tube flexuose, pouched at the base; lobes broad, rounded. Brazil. (Florence B. G.)

Coelogyne albo-lutea. (*K. B.* 1908, 414.) Orchidaceae. S. A distinct and handsome new species. Pseudobulbs ovoid-oblong, about 3 in. long, 2-leaved. Leaves shortly petiolate, lanceolate-elliptic, 6–7 in. long, 1¾-2 in. broad. Scape arched, 6–7 in. long, 5–7-flowered. Flowers showy, very fragrant, pure white, with the greater part of the side lobes deep yellow, and the base of the front lobe rather lighter yellow. Sepals lanceolate-oblong, 1–1¼ in. long. Petals similar, not keeled. Lip 3-lobed, about ¾ in. long. Mountains of Northern India. (F. Sander & Sons; Glasnevin B. G.)

***Coelogyne perakensis.** (*B. M.* t. 8203.) S. A new species closely allied to *C. sulphurea*, under which name it has been cultivated. It differs in having larger pseudobulbs, longer sheaths to the scapes, and distinctly narrower bracts. Sepals spreading, lanceolate-oblong, ½ in. long, light buff. Petals linear, light green, rather shorter than the sepals. Lip strongly 3-lobed, light yellow, with a deep yellow blotch on the disk. Perak. (Glasnevin B. G.; Kew.)

Coelogyne virescens. (*K. B.* 1908, 70.) S. A new species having a general resemblance to *C. Parishii*, but quite distinct in the crest. Flowers pale green, with very dark dots on the lip. Sepals 1¼ in. long. Lip ¾ in. long, 3-lobed, slightly recurved; lateral lobes oblong, obtuse, scarcely ½ in. long; median lobe ovate, very much waved; disk 3-keeled; keels crenulate. Annam. (F. Sander & Sons.)

Coriaria nepalensis var. **maxima.** (*M. D. G.* 1907, 66.) Coriariaceae. H. A quick-growing evergreen shrub climbing to a height of 10–13 ft. Leaves about 4 in. long and broad. Fruits black. Himalaya. (C. Sprenger, Vomero, Naples.)

Coriaria sinica. (*M. D. G.* 1907, 66.) H.? Described as a very beautiful evergreen species, with roundish leaves. Central China. (C. Sprenger, Vomero, Naples.)

Cornus sanguinea aureo-marmorata. (*M. D. G.* 1907, 255.) Cornaceae. H. All the leaves on the youngest shoots completely marbled with pale yellow. (Schlosspark zu Biebrich, Germany.)

Cornus sanguinea var. **Moseri.** (*T. H.* 1908, 89; *O. G. Z.* 1908, 27.) H. Leaves of a beautiful yellowish white, variegated with rose and purple. [Syn. *C. sanguinea variegata Moseri*; R. H. 1907, 501.]

***Corydalis Alleni.** (*Gard.* 1908, 291, f.) Papaveraceae. H. An early-flowering plant apparently of hybrid origin and probably derived from *C. tuberosa*. Flowers yellow-white, tinged with purple. (A. Perry; Kew.)

***Corytholoma macropodum.** (*K. B.* 1908, 20; *B. M.* t. 8228.) Gesneraceae. S. Glandular-hirsute herb, 6–9 in. high, with a subglobose tuber. Stems 1 or 2, unbranched, bearing 1 or 2 pairs of suborbicular leaves 3–5 in. across. Cymes solitary, axillary, 5–7-flowered, on peduncles 2–4 in. long. Corolla cinnabar-red; tube about 1 in. long, nearly cylindric; limb very slightly 2-lipped; lobes 5, spreading, rounded, the lower 3 blotched with purple. S. Brazil. (Kew.)

***Cotoneaster rugosa var Henryi.** (*Veitch, Nov.* 1908–9, 6, 19, f.) Rosaceae. H. A free-growing variety. Leaves lanceolate, 3 in. long, bright green when young, dark green when old. Berries rich crimson-brown, borne in clusters. China. (J. Veitch & Sons.)

***Cotyledon lateralis.** (*K. B.* 1908, 447.) Crassulaceae. G. Stem short, 1¼–1¾ in. thick, simple. Leaves linear-ligulate, 3¼–4½ in. long, ⅔–¾ in. broad, in a dense rosette. Cymes pedunculate, spreading horizontally, as long as or scarcely longer than the leaves, compact. Flowers 80–130 in each cyme. Corolla greenish yellow, subcylindric, 5 lin. long, 2 lin. across. Probably Mexico or adjacent regions. (Kew.)

Crassula Mariae. (*B. H. B.* 1908, 715.) Crassulaceae. G. Stem erect, slender, simple, 4–8 in. high. Leaves opposite, decussate, sessile, ovate, ¾–1¾ in. long, ¼–¾ in. broad, the lower in a dense rosette, densely papillose on the margin, less so on the under side, glabrous above. Flowers very small, in axillary spike-like inflorescences 1¼–2½ in. long. Mozambique. (W. Barbey, Pierrière, Geneva.)

Crinum Vassei. (*B. M. H. N.* 1907, 444; *R. H.* 1908, 132, f.) Amaryllidaceae. G. Bulb ovoid, 4 in. across, without a distinct neck. Leaves linear-lorate, up to 2 ft. long, 2 in. broad, scabrid on the margin. Scape 10 in. long, compressed. Umbels 15-flowered. Perianth funnel-shaped. 8 in. long; tube cylindric, curved, red; segments linear-lanceolate, slightly shorter than the tube, white, with a red median stripe. Mozambique. (Paris B.G.)

Crocus aerius major. (*G. M.* 1908, 300, as *C. aerius majus.*) Iridaceae. H. A very fine form. (T. Smith, Newry.)

Cryptomeria japonica nana. (*M. D. G.* 1907, 256.) Coniferae. H. Very dwarf, forming a small globose bush. (Fritz Graf v. Schwerin, Wendisch-Wilmersdorf, Germany.)

Cyclamen aegineticum. (*Gfl.* 1908, 296.) Primulaceae. H.? This and the three following are new species, apparently of little horticultural value. *C. aegineticum* is intermediate between *C. graecum* and *C. pseudo-graecum*, differing from the former in the smallness of its parts, especially the flower, from the latter in its more rounded leaves, and from both in the marking of the corolla. Greece. (Freiburg B. G.)

Cyclamen Jovis. (*Gfl.* 1908, 294.) H.? Very near *C. neapolitanum* from which it may be distinguished by the slenderness of the flowers, in which the lobes of the calyx and corolla are longer. Asia Minor. (Freiburg B. G.)

***Cyclamen maritimum.** (*Gfl.* 1908, 291.) H.? This and *C. pseudo-maritimum* are remarkable for the brown-green colour of the leaves, which vary considerably in form and marking. Flowers produced in September with the leaves, inconspicuous, pale rose, with a deep carmine mark at the base of the corolla-lobes. Southern Asia Minor. (Freiburg B. G.)

Cyclamen pseudo-maritimum. (*Gfl.* 1908, 293.) H.? Leaves as in *C. maritimum*, but the species differs in having lanceolate and acuminate instead of ovate and rounded calyx-lobes, and long-acuminate instead of rounded corolla-lobes. Southern Asia Minor. (Freiburg B. G.)

Cymbidium eburneum Goodsonianum. (*G. C.* 1908, xliii. 254; *O. R.* 1908, 140; *G. M.* 1908, 322.) Orchidaceae. G. Flowers white, with a broad rose-purple band down the middle of the lip. (H. S. Goodson.)

Cymbidium gattonense. (*G. C.* 1908, xliii. 77; *O. R.* 1908, 71; *G. M.* 1908, 132.) G. A garden hybrid between *C. Lowianum* and *C. Tracyanum.* (Sir J. Colman.)

Cymbidium rosefieldiense. (*G. C.* 1908, xliv. 453.) G. A garden hybrid between *C. Tracyanum* and *C. grandiflorum.* (De B. Crawshay.)

Cymbidium Sanderi splendens. (*G. W.* 1908, 231, f.; *J. of H.* 1908, lvi. 221.) S. Sepals and petals white, with rose midribs and lateral nerves. Lip rose-red inside, densely covered with crimson spots and streaks. (F. Sander & Sons.) [Syn. *C. insigne* Rolfe, var.]

Cymbidium Sanderi superbum. (*J. of H.* 1908, lvi. 221.) S. Flowers very large, pink, with a white lip which is mottled with dark red and has a yellow band in the throat. (F. Sander & Sons.) [Syn. *C. insigne*, Rolfe, var.]

Cypripedium Armstrongii. (*G. C.* 1908, xliv. 418; *G. M.* 1908, 944; *J. of H.* 1908, lvii. 574.) Orchidaceae. S. Said to have been imported with *C. Spicerianum*, of which it may be regarded as a very fine form, or possibly a natural hybrid derived from it. The white dorsal sepal has a green base and a purple median band. (Armstrong & Brown.) [*Paphiopedilum.*]

Cypripedium Charlesworthii Bromilowianum. (*G. C.* 1908, xliv. 285, f. 132; *G. M.* 1908, 807; *J. of H.* 1908, lvii. 469, f.) S. An albino form. Dorsal sepal pure white, with a tinge of green at the base. Petals and lip pale green, quite destitute of the brown or purple colour of the type. (H. J. Bromilow.) [*Paphiopedilum.*]

Cypripedium Dupreanum. (*R. H. B.* 1908, 13.) G. A garden hybrid between *C. insigne Chantini* and *C. Lathamianum.* (F. Stepman, Brussels.) [*Paphiopedilum.*]

Cypripedium Eustacianum. (*G. C.* 1908, xliii. 19.) S. A garden hybrid between *C. superbiens* and *C. Argus.* (E. F. Clark.) [*Paphiopedilum.*]

Cypripedium Fairrieanum nigrum. (*G. C.* 1908, xliii. 108.) S. Dorsal sepal clear white, with a broad band of blackish purple. (Moore & Co.) [*Paphiopedilum.*]

Cypripedium Gilsonianum. (*T. H.* 1908, 125.) S. A garden hybrid between *C. politum* and *C. Sallieri.* (F. Lambeau, Brussels.) [*Paphiopedilum.*]

Cypripedium Godefroyae var. Rogersoni. (*O. R.* 1908, 208.) S. Flower of a good shape and richly spotted. (E. Rogerson.) [*Paphiopedilum.*]

Cypripedium insigne var. Arnoldii. (*O. R.* 1908, 42.) G. Flower greenish yellow, with greenish raised blotches on the dorsal sepal. (J. Gurney Fowler.) [*Paphiopedilum.*]

Cypripedium Rosettii. (*G. C.* 1908, xliv. 150; *J. of H.* 1908, lvii. 185.) G. A garden hybrid between *C. insigne Sanderae* and *C. Maudiae.* (G. L. Holford.) [*Paphiopedilum.*]

Cypripedium Thunbergii. (*O. R.* 1908, 186.) H. Similar to *C. macranthon* with which it has been confused, but the flowers instead of being deep rose-purple, as in that species, are invariably veined and mottled with light rose and white, and they have a narrower more acute staminode. Japan. (Cutbush & Sons; Kew.)

Cypripedium ventricosum album. (*G. C.* 1908, xliii. 414, f. 183.) H. Flowers white. (Cutbush & Sons.) [*C. macranthon album.*]

Cypripedium villosum Stanleyi. (*G. C.* 1908, xliii. 108.) S. "A large and good form." (Stanley & Co.) [*Paphiopedilum.*]

Cyrtomium falcatum var. Mayi. See Aspidium.

Cyrtostachys Renda var. Duvivieriana. (*R. H.* 1908, 230, f. 88; *R. H. B.* 1908, 196.) Palmae. S. Remarkable on account of the brilliant red colouring of the trunk, and of the petioles and midribs of the leaves. (L. De Smet-Duvivier, Mont St. Amand, Belgium.)

Dahlia coronata. (*G. C.* 1908, xliii. 237; *Gfl.* 1908, 595; *O. G. Z.* 1908, 19.) Compositae. HH. A slender-growing plant 4–5 ft. high. Peduncles $1\frac{3}{4}$–$2\frac{1}{3}$ ft long. Flower-heads orange-scarlet, sweet-scented; ray-florets slightly curved inwards. See also *G. C.* 1908, xliii. 218; *J. of H.* 1908, lvi. 425; *Jard.* 1908, 44. Mexico. (T. C. Schmidt, Erfurt, Germany; G. Bruant, Poitiers, France.)

Davallia Lansonniana. (*G. C.* 1908, xliii. 284.) Filices. G. or S. Name only. (L. De Smet-Duvivier, Mont St. Amand, Belgium.)

Davidia laeta. (*R. H.* 1908, 407.) Cornaceae. H. In cultivation as *D. involucrata.* It is supposed to be different from that species in having the leaves yellowish green beneath, glabrous or almost glabrous, bristly toothed, the ovary shortly attenuate, and the fruit almost globose. Central China. (J. Veitch & Sons.)

Davidia Vilmoriniana. (*R. H.* 1908, 406.) H. This is the plant included in the List of 1902 as *D. involucrata*, from which it differs in having the leaves glaucous beneath, glabrous or glabrescent, bristly toothed, the ovary more shortly attenuate, and the fruit more globose. The true *D. involucrata* is characterised by a persistent dense pubescence on the leaves. Central China. (M. L. de Vilmorin, Les Barres, France.)

Dendrobium bicaudatum. (*G. C.* 1908, xliv. 323.) Orchidaceae. S. Flowers several, about $1\frac{1}{2}$ in. across, in erect spikes. Sepals and petals lanceolate or narrowly lanceolate, whitish, changing to greenish yellow, with some faint purple lines. Lip elongated, white; side lobes folded over the column, streaked with purple; median lobe with several wavy ridges tipped with purple. Java. (Sir J. Colman.)

Dendrobium Coelogyne maximum. (*G. C.* 1908, xliv. 316; *G. M.* 1908, 831; *O. R.* 1908, 343.) S. A very large form, the flower measuring 8 in

across. Sepals and petals yellow, streaked with purple, white at the base. Lip with dark markings as in the type. (Charlesworth & Co.)

Dendrobium Coelogyne striatum. (*G. C.* 1908, xliv. 418; *G. M.* 1908, 944; *J. of H.* 1908, lvii. 585, f.) S. Sepals and petals yellow, striped with chocolate-purple. Lip blackish purple. (H. A. Tracy.)

***Dendrobium criniferum.** (*G. C.* 1908, xliii. 194, f. 81; *O. R.* 1908, 254.) S. Flowers very fugacious, lasting only a single day, whitish, with a 3-lobed lip which breaks up in front into a fringe of long spreading yellow filaments. Reintroduced. It was in cultivation in 1844. Malaya. (Kew.)

Dendrobium epidendropsis. (*Orch.* ii. 79, f. 12.) S. Remarkable for its resemblance to an *Epidendrum* of the *E. umbellatum* group. Racemes long-pedunculate, usually few-flowered. Flowers greenish yellow outside, yellow inside, about 1½ in. long. Philippines. (Erlangen B. G.)

Dendrochilum maleolens. (*Orch.* ii. 63.) S. Pseudobulbs spindle-shaped or lanceolate, small. Stems 1-leaved. Leaves lanceolate, acuminate or aristate, scarcely ¾ in. long and ½ in. broad. Scapes longer than the leaves, up to 8-flowered. Flowers only about ¼ in. across, green, with orange-red rostellum, malodorous. Philippines. (Erlangen B. G.)

Deutzia discolor arcuata. (*Lemoine Cat.* 1908–9, n. 170, vii. f.) Saxifragaceae. H. A garden hybrid between *D. scabra* and *D. discolor purpurascens*. (V. Lemoine & Son, Nancy.)

Deutzia discolor densiflora. (*Lemoine Cat.* 1908–9, n. 170, vii. f.) H. A garden hybrid between *D. scabra* and *D. discolor grandiflora*. (V. Lemoine & Son.)

Deutzia gracilis erecta. (*Lemoine Cat.* 1908–9, n. 170, vii.) H. A garden hybrid between *D. gracilis* and *D. Sieboldiana*. (V. Lemoine & Son.)

Diacattleya Colmaniae. (*O. R.* 1908, 80, f. 14; *Gard.* 1908, 95.) Orchidaceae. G. A garden hybrid between *Diacrium bicornutum* and *Cattleya intermedia nivea*. (Sir J. Colman.) [Syn. *Diacrocattleya Colmaniae*; G. C. 1908, xliii. 108, 114, f. 45; J. of H. 1908, lvi. 156, 167, f.; G. M. 1908, 143.]

Dicentra torulosa. (*Vilm. Not.* 1908–9, vi.) Papaveraceae. H. An annual climbing species growing to a height of 10–16 ft. Leaves elegantly cut. Flowers yellow, 6 to 8 together, followed by numerous red fruits. Himalaya. (Vilmorin - Andrieux & Co., Paris.)

***Didymocarpus cyanea.** (*B. M.* t. 8204.) Gesneraceae. S. A stemless herb. Leaves in a rosette, ovate, elliptic or obovate, 3–6 in. long, 1½–3 in. broad; petioles ¾–2½ in. long. Scapes 2 or more, 4- or 5-flowered. Corolla deep blue, trumpet-shaped, about 1½ in. long; lobes spreading. Malay Peninsula. (Kew.)

***Didymosperma Hookeriana.** (*R. H. B.* 1908, 193; *Jard.* 1908, 152.) Palmae. S. A distinct species resembling a *Caryota*, about 3 ft. high. Leaves unequally pinnatisect, silvery, dotted with brown beneath; segments coarsely toothed or erose. Malay Peninsula. (F. Sander & Sons.)

Dimorphotheca Barberiae rosea. (*G. C.* 1908, xliv. 363.) Compositae. G. Flower-heads rather smaller than in the type, rose-coloured, with a bronze tint on the under side of the ray-florets. Transvaal. (W. E. Gumbleton.)

Dipelta ventricosa. (*G. C.* 1908, xliv. 101, f. 37.) Caprifoliaceae. H. A shrub 7–15 ft. high, with long straight slender flowering branches. Leaves opposite, ovate, usually 3–5 in. long, tapering into a long slender tip. Flowers solitary or 2 together in the axils of the leaves, or in clusters of 3–7 at the ends of short branches. Corolla about 1¼ in. long, 2-lipped and with a broad bulging tube, purple red outside, white, with bright orange markings on the lower face, inside. W. China. (J. Veitch & Sons.)

Disa longicornu. (*O. R.* 1908, 165.) Orchidaceae. G. Plant ½–1 ft. high, producing a single flower about 2 in. long, resembling a light blue *Delphinium*. Lateral sepals and lip lilac-blue. Dorsal sepal hood-shaped, with a long spur, rather paler, lined inside with bright green forked veins. S. Africa. (Glasnevin B. G.)

Echinocereus pensilis. (*M. K.* 1908, 5, f.) Cactaceae. G. Branches curved and ascending, 1 ft. long or more, or prostrate or pendulous, when they reach a length of 6 ft., 2–2½ in. thick. Ribs 8–10. Areolae about ¾ in. apart. Spines rather thin, bulbous at the base, at first yellow, afterwards reddish grey, brown at the base; radial usually 8, central 1, all about the same length, ½–¾ in. long. Flowers red, 2–2½ in. long, excluding the somewhat longer slender tube. Ovary and

perianth-tube furnished with yellow wool and thin chesnut-brown spines about ½ in. long. Lower California. (Darmstadt B. G.)

***Encephalartos Woodii.** (*G. C.* 1908, xliii. 257, Suppl. Ill., May 2; *R. H.* 1908, 229; *R. H. B.* 1908, 193, f.; *Gfl.* 1908, 325.) Cycadaceae. S. Closely allied to *E. Altensteinii*. The cultivated plants have a stem 18 in. high and 8 in. thick, bearing at the summit 25 leaves. Leaves gracefully curved, up to 5 ft. long, bright shining green; leaflets up to 8 in. long and 2 in. broad, the broadest irregularly pinnatifid; teeth and tip of leaflets spiny. Zululand. (F. Sander & Sons.)

Epicattleya candida. (*J. H. F.* 1908, 210.) Orchidaceae. G. A garden hybrid between *Epidendrum nocturnum* and *Cattleya Skinneri*. (G. Lesueur, Saint Cloud, Seine & Oise, France.)

***Epidendrum costatum.** (*G. C.* 1908, xliv. 76, 425, f. 173; *O. R.* 1908, 251; *Gard.* 1908, 379.) Orchidaceae. G. Resembles in habit and in its very thick fleshy roots the section *Barkeria*. Inflorescence terminal, nodding, with 10–15 flowers, each about 1 in. across. Sepals and narrower petals reddish-brown, with an acuminate yellow tip. Lip whitish, ridged and blotched with purple. Reintroduced. It was in cultivation in 1845 and again in 1889. Mexico. (Sir Trevor Lawrence.)

Epidendrum punctiferum. (*G. C.* 1908, xliv. 453.) G. Resembles *E. inversum*. Flowers in erect spikes, green, the lip spotted with purple. Brazil. (Sir Trevor Lawrence.)

Epidendrum saccharatum. (*Orch.* ii. 113, f. 17.) G. Nearest allied to *E. marmoratum*. Pseudobulbs rather densely aggregated, subcylindric, 8–10 in. long. Leaves usually 3, lanceolate, acute, up to 10 in. long. Raceme about as long as the leaves, 15-20-flowered. Flowers about 1¼ in. across, green outside, greenish yellow inside, marked with dark brown stripes or spots. Lip white, rose-purple at the apex. British Guiana. (O. Beyrodt, Marienfelde, Berlin.)

Epidiacrium Colmanii. (*O. R.* 1908, 115, 119; *G. C.* 1908, xliii. 190.) Orchidaceae. G. A garden hybrid between *Epidendrum ciliare* and *Diacrium bicornutum*. (Sir J. Colman.)

Eremurus Bungei magnificus. (*Gard.* 1908, 335; *G. C.* 1908, xliii. 421; *G. M.* 1908, 521; *J. of H.* 1908, lvi. 584.) Liliaceae. H. A more robust form, with a much larger inflorescence and brighter yellow flowers. Said to be a seedling from *E. Warei*. (J. Veitch & Sons.)

Eria amica. (*G. C.* 1908, xliii. 321; *O. R.* 1908, 171; *J. of H.* 1908, lvi. 456.) Orchidaceae. G. Flowers very small, in dense bracteate racemes, white, with red stripes and a yellow lip. India. (Sir Trevor Lawrence.)

Eria hyacinthoides. (*B. M.* t. 8229.) S. An epiphyte, about 1 ft. high. Pseudobulbs erect, oblong, 2½–3 in long, 2- or 3-leaved. Leaves petiolate elongate-oblong, 8–12 in. long, about 1½ in. broad. Peduncles erect, 4–6 in. long. Flowers white, with a yellow anther, pubescent, about ½ in. long. Java. (Glasnevin B. G.)

***Erica cinerea pygmaea.** (*G.C.* 1908, xliii. 421; *G. M.* 1908, 521; *J. of H.* 1908, lvi. 584.) Ericaceae. H. A very dwarf form, only about 4 in. high, with brilliant crimson flowers. (G. Reuthe.)

Eriopsis Fuerstenbergii. (*Orch.* ii. 62.) Orchidaceae. G. Pseudobulbs 3¼–4 in long, 1¾–2 in. thick at the base, 2-leaved. Leaves oblong-lanceolate, acute, up to 16 in. long, 3–3¼ in. broad. Racemes up to 12 in. long. Flowers about 1¾ in. across. Sepals ovate, brown outside, orange with a brown border inside. Petals similar but smaller and more acute, tawny. Lip whitish, very densely dotted with purple. Country unknown. (Baron von Fuerstenberg, Hugenpoet, Mintard, Germany.)

***Eupatorium Raffillii.** (*B. M.* t. 8227.) Compositae. G. Cultivated for many years as *E.* (*Hebeclinium*) *ianthinum*, which it closely resembles, but differs in having a cobwebby-tomentose subumbellate inflorescence, with the heads of flowers larger and richer in colour, and the involucral bracts fewer. Central America. (Birmingham B. G.)

Evodia officinalis. (*B. S. B. F.* 1908, 703.) Rutaceae. H. A small tree, with pinnate leaves of 5–11 ovate or lanceolate leaflets, and corymb-like inflorescences of small flowers. Of interest chiefly on account of its bitter bark, which is used in China for giving a yellow colour and bitter taste to a kind of beer. Central China. (M. L. de Vilmorin, Les Barres, France. Cultivated?)

Exochorda grandiflora prostrata. (*M. D. G.* 1907, 255.) Rosaceae. H. A form with prostrate branches. (Fritz Graf v. Schwerin, Wendisch-Wilmersdorf, Germany.)

Fagus grandifolia f. **pubescens.** (*M. D. G.* 1907, 71.) Cupuliferae. H. The whole of the underside of the leaves is more or less hairy. Massachusetts. (Cultivated in Germany.)

Fagus orientalis. (*M. D. G.* 1907, 85.) H. Crown more or less pyramidal. Young branches very hairy. It differs from *F. sylvatica* in having the scales of the involucre broadened towards the apex, the leaves broadest above the middle, and persistent stipules, semicordate at the base, bristle-like above. Asia Minor; N. Persia; Caucasus. (H. Zabel, Gotha.)

***Ficus australis variegata.** (*G. C.* 1908, xliii. 284; *Jard.* 1908, 152; *R. H.* 1908, 230; *Gfl.* 1908, 326.) Urticaceae. S. A dwarf plant, with oval or oblong leaves, green, variegated with white or yellow. (F. Sander & Sons.)

Fraxinus excelsior leucocarpa. (*M. D. G.* 1907, 96.) Oleaceae. H. A form with white-variegated or quite white fruits. (In cultivation near Arnheim, Holland.)

***Gasteria Huttoniae.** (*K. B.* 1908, 440.) Liliaceae. G. Leaves in a loose rosette, 16–18 in. long, 7–12 in. broad at the base, narrowed above, obliquely keeled, 1¾-2 in. thick, green on both sides and obscurely variegated with zones of greenish-white spots. Peduncle loosely paniculately branched, 4–5 ft. high; pedicels 1½ lin. long. Flowers pendulous, nearly 1 in. long, rose-cinnabar, pale rose above, with green-keeled lobes. S. Africa. (Kew.)

Geodorum purpureum. (*G. C.* 1908, xliv. 76; *O. R.* 1908, 246; *Gard.* 1908, 379.) Orchidaceae. G. Similar to a *Bletia* in habit. Leaves large. Scape erect, bearing a densely-flowered raceme drooping at the apex. Flowers small, white, with purple dots or markings on the lip. Himalaya. (Sir Trevor Lawrence.)

Gesneraceae. An annotated list of the Gesneraceae which have been introduced into cultivation is given by R. H. Beddome in *J. R. H. S.* xxxiii. 74–100.

Habenaria geniculata. (*G. C.* 1908, xliv. 254.) Orchidaceae. G. A slender-growing species. Flowers white, with a green spur about 2 in. long. Himalaya; Burma. (Sir Trevor Lawrence.)

Haemanthus Helleputteanus. (*T. H.* 1908, 254.) Amaryllidaceae. S. A garden hybrid between *H. Eetveldeanus* and *H. diadema*. (F. Lambeau, Brussels.)

Halesia tetraptera f. **dialypetala.** (*M. D. G.* 1907, 75.) Styraceae. H. Corolla completely or partially divided into 4 obovate petals. (Arnold Arboretum.)

Helianthus cucumerifolius plumosus. (*R. H.* 1908, 123.) Compositae. H. A form in which the disk-florets are ligulate, varying in colour from pale to deep yellow, and surrounded by longer ray-florets which are sometimes of a different shade of yellow. (M. Herb, Naples.) [*H. debilis* var.]

Helianthus macrophyllus var. **sativus.** (*N. B.* v. 108.) H. Larger and more robust than the type, with longer tubers and more subacute thinner leaves. The plant has been in cultivation for some years under the name of "Helianthi" or "Hélianti." Its tubers are edible, resembling in taste those of the Jerusalem Artichoke. N. America. (Berlin-Dahlem B. G.)

Heliconia Micholitzii. (*G. C.* 1908, xliv. 13.) Scitamineae. S. A very large plant, forming large tufts. Stems 2 ft. high or more. Leaves green; blade about 3 ft. long, 11 in. across. Inflorescence 12 in. long, with a hairy peduncle about 6 in. long. Bracts 4 or 5, 6 in. long, 1 in. broad, green, edged with pink. Flowers about 14 in each bract. Sepals and petals lanceolate, acute, dusky brown. New Ireland. (Singapore B. G.)

Heliopsis scabra zinniaeflora. (*R. H.* 1908, 419, f. 161.) Compositae. H. A "double" form, there being several series of ligulate florets. (V. Lemoine & Son, Nancy.)

Helleborus niger praecox. (*R. H.* 1908, 512; *Gfl.* 1908, 579.) Ranunculaceae. H. Flowers smaller than in the type, produced from September to February.

***Hibiscus aponeurus.** (*B. M.* t. 8231.) Malvaceae. G. An erect shrubby plant, 1–4 ft. high. Leaves ovate or elliptic, sometimes slightly 3-lobed, 1–1½ in. long, ⅝–1¼ in. broad, petioles ⅓–⅝ in. long. Flowers solitary, axillary, on peduncles over 1 in. long. Bracteoles 9–13, linear-subulate, ⅛–¼ in. long. Corolla brilliant scarlet, 1 in. across. Tropical East Africa. (Lady Hindlip; Kew.)

***Holothrix villosa.** (*G. C.* 1908, xliv. 179.) Orchidaceae. G. A small terrestrial species. Leaves round, fleshy, hairy, borne close to the surface of the soil. Inflorescence slender, erect.

about 9 in. high, with about 30 small yellowish green slightly fragrant flowers. S. Africa. (Charlesworth & Co.)

Impatiens comoricoma. (*R. H.* 1908, 427, ff. 163–164.) Geraniaceae. G. A garden hybrid between *I. comorensis* and *I. auricoma*. (Cayeux & Le Clerc, Paris.)

Impatiens Holstani. (*R. H.* 1903, 425.) G. or H. H. A garden hybrid between *I. Holstii* and *I. Sultani*. (Cayeux & Le Clerc, Paris.)

***Inula glandulosa laciniata.** (*R. H.* 1908, 338.) Compositae. H. Probably the same as *I. glandulosa fimbriata* in the List of 1903. (Cayeux & Le Clerc, Paris.)

Ione grandiflora. (*K. B.* 1908, 413.) Orchidaceae. S. Pseudobulbs ovoid, up to ¾ in. long, 1-leaved. Leaves oblong, 1¼–2 in. long, scarcely ½ in. broad, subacute, leathery. Scapes erect, about ¾ in. long, 1-flowered. Flowers about ⅔ in. long, dull lurid-purple. Sepals and petals oblong, acute. Lip broadly cordate-ovate, papillose-hirsute above, concave and keeled at the base. Burma. (Sir Trevor Lawrence; Glasnevin B. G.)

Ione siamensis. (*K. B.* 1908, 413.) S. Pseudobulbs tetragonal-ovoid, about ¾ in. long, 1-leaved. Leaves narrowly oblong, 3 in. long, scarcely ½ in. broad, subacute, leathery. Scapes suberect, slender, about 6 in. long, bearing a 9–10-flowered raceme about 2½ in. long. Flowers about ⅓ in. long, pale green, with a suffusion of dull purple on the lateral sepals and lip and a few minute purple dots near the margin of the other segments. Siam. (Trinity Coll. B. G., Dublin.)

Iris carthusiana. (*G. C.* 1908, xliii. 390; *G. M.* 1908, 474, 478, f.; *Gard.* 1908, 315, f.) Iridaceae. H. A garden hybrid between an unnamed Syrian species and *I. pallida dalmatica*. (J. W. Marshall.)

Iris kumaonensis caulescens. (*G. C.* 1908, xliii. 396.) H. Differs from the type in having a stem 6 in. long. The standards are pale mauve-lilac, and are inclined outwards; falls deep purple-lilac, mottled with a still deeper shade; beard of fine white hairs tipped with deep orange. Sikkim Himalaya. (Barr & Sons; W. R. Dykes.)

***Iris minuta.** (*G. C.* 1908, xliii. 396.) H. Rhizome slender. Leaves linear, acuminate, 5–6 in. long, ¼–⅓ in. broad. Peduncle very short, 1-headed; spathe-valves green, lanceolate; pedicel about 1 in. long. Perianth-tube about 1 in. long; limb bright yellow (or lilac?), shorter than the tube; falls with an ovate spreading blade half as long as the haft, marked with fine brown dots and lines; standards much shorter, oblanceolate, clawed, brown on the edges. See *Baker, Handb. Irideae*, 2. Japan. (W. R. Dykes.)

Iris olbiensis × Korolkowii. (*G. C.* 1908, xliv. 3.) H. A garden hybrid. (W. R. Dykes.)

***Iris tectorum** var. **alba.** (*Gfl.* 1908, 169, t. 1571.) H. Flowers white with some yellow chiefly on the claws of the segments. (C. Sprenger, Vomero, Naples.)

Iris tectorum var. **atrocoerulea.** (*Gfl.* 1908, 169.) H. Flowers dark blue. (C. Sprenger.)

Iris tectorum var. **lilacina.** (*Gfl.* 1908, 169.) H. Flowers lilac. (C. Sprenger.)

Jacksonia sericea. (*I. S. H. T.* vi. 101, t. 228.) Leguminosae. G. A leafless shrub, with slender striate angular or flattened often spiny branches. Flowers ¼–⅓ in. long, yellow, in irregular terminal loose racemes, or solitary. Calyx-lobes linear, about as long as the corolla. W. Australia. (L. van. der Bossche, Tirlemont, Belgium.)

***Kaempferia Kirkii** var. **elatior.** (*B. M.* t. 8188.) Scitamineae. S. Chiefly differs from the type in being taller, and the large rose-coloured flowers have a golden-yellow blotch in the throat of the lip, marked on both sides with purple. Rhodesia. (H. J. Elwes.)

Kalanchoe latisepala. (*K. B.* 1908, 435.) Crassulaceae. G. Near *K. Dyeri*, but the leaves are sessile and the flowers only about half the size. Stem about 2 ft. high. Leaves obovate, up to 4½–5 in. long and 3¼–3¾ in. broad. Cymes terminal, many-flowered. Corolla white; tube 1¼ in. long; lobes spreading, ovate or elliptic-ovate, ½ in. long. Nyasaland. (Kew.)

Kalanchoe Luciae. (*B. H. B.* 1908, 254.) G. Stem robust, erect, simple. Leaves sessile, obovate or obovate-spathulate, 1¾–3½ in. long, 1½–3 in. broad, entire or scarcely sinuate. Inflorescence panicle-like, without a distinct peduncle. Corolla urn-shaped, scarcely ½ in. long, colour not stated; segments somewhat shorter than the tube, oblong-linear. Transvaal. (W. Barbey, Pierrière, Geneva.)

Kentia Belmoreana versicolor. (*G. C.* 1908, xliii. 284.) Palmae. S. Name only. (L. De Smet-Duvivier, Mont St. Amand, Belgium.) [*Howea Belmoreana* var.]

Kentia Siebertiana. *See* **Ptychoraphis.**

***Kitchingia uniflora.** (*K. B.* 1908, 258.) Crassulaceae. G. A dwarf herb with prostrate glabrous stems rooting at the nodes. Leaves obovate, 3½–5 lin. long, 3–3½ lin. broad, somewhat fleshy; teeth crenate, 1 or 2 each side; petioles very short. Flowers solitary, on filiform pedicels. Corolla a beautiful purple, tubular, slightly constricted at base and mouth, 4-toothed, about 1 in. long. Madagascar. (Kew.)

Laelia anceps Roeblingiana. (*G. C.* 1908, xliii. 211.) Orchidaceae. S. A peloriate form. See *O. R.* 1898, 40. (C. G. Roebling, Trenton, New Jersey, U.S.A.)

Laelia bella. (*G. C.* 1908, xliv. 76; *O. R.* 1908, 246.) G. A garden hybrid between *L. majalis* and *L. purpurata*. The same name has been given to a hybrid between *L. purpurata* and *Cattleya labiata*. See *G. C.* 1884, xxi. 174. (Sir Trevor Lawrence.)

Laelia Groganii. (*O. R.* 1908, 125.) S. A garden hybrid between *L. flava* and *L. crispa*. (J. H. Grogan.)

Laelia Rogersii. (*O. R.* 1908, 248, 264.) S. A garden hybrid between *L. Dayana* and *L. Cowanii*. (O. O. Wrigley.)

Laelio-cattleya Isaacii. (*O. R.* 1908, 29, 64.) Orchidaceae. G. A natural hybrid, probably between *Cattleya Harrisoniana* and *Laelia Boothiana*. (M. Isaac.)

Laelio-cattleya Oliveri. (*O. R.* 1908, 187.) G. A garden hybrid of doubtful parentage, but possibly between *Cattleya Percivaliana* and *L.-c. intermedio-flava*. (E. F. Clark.)

Leptospermum Chapmannii. (*G. C.* 1908, xliii. 399.) Myrtaceae. G. A form of *L. scoparium*, with brownish instead of green leaves, and bright rose flowers. New Zealand.

Leptospermum Nichollii. (*G. C.* 1908, xliii. 399.) G. A form of *L. scoparium*, with leaves resembling in colour those of the Copper Beech, and blood-red flowers. New Zealand.

Lespedeza floribunda. (*M. D. G.* 1907, 66.) Leguminosae. H. An evergreen free-flowering shrub, with 3-foliolate leaves and racemes of purple flowers. Central China. (C. Sprenger, Vomero, Naples.)

***Leucojum vernum** var. **Vagneri.** (*G. C.* 1908, xliii. 131.) Amaryllidaceae. H. A tall robust early-flowering variety, with scapes usually bearing two flowers of which the green spots are of a darker shade. Hungary. (S. Arnott.) [*L. vernum* var. *carpaticum*.]

Libocedrus decurrens aureo-variegata. (*M. D. G.* 1907, 256.) Coniferae. H. Variegated with clear golden-yellow. (Metz B. G.)

***Ligustrum vulgare** var. **lutescens.** (*G. C.* 1908, xliii. 301.) Oleaceae. H. Flowers deep cream-yellow. Austria. (Innsbruck B. G.)

Liparis rhodochila. (*K. B.* 1908, 412.) Orchidaceae. S. Pseudobulbs tufted, broadly ovoid-oblong, about 7 lin. long and broad, 1-leaved. Leaves elliptic-oblong, 3 in. long, 1¼ in. broad. Scape terminal, erect, 3–4 in. long, many-flowered. Sepals and petals 4 lin. long, light green, the former reflexed and oblong, the latter linear. Lip reddish crimson, with a broad erect claw and a closely reflexed obovate limb. Java. (Sir Trevor Lawrence.)

***Liparis tabularis.** (*K. B.* 1908, 68; *B. M.* t. 8195.) S. Pseudobulbs narrowly conical, 3–5 in. long. Leaves membranous, ovate-elliptic, 3–5½ in. long, nearly 2 in. broad, plicate. Scape erect, about 6 in. high, acutely 5-angled, purple, bearing a lax many-flowered raceme. Flowers large, reddish purple. Sepals oblong-lanceolate or oblong, about ½ in. long. Petals filiform, as long as the sepals. Lip orbicular, ⅝ in. broad. Penang. (H. T. Pitt.) [= *L. atropurpurea*, Ridley.]

***Liparis Warpuri.** (*K. B.* 1908, 69.) S. A small tufted herb only a few inches high, with fleshy 1-leaved stems. Leaves sessile, narrowly ovate, 1¼–2 in. long, scarcely ½ in. broad. Scapes slender, 2- or 1-flowered at the apex. Flowers about ¾ in. long, light green, with a dark green disk to the lip. Madagascar. (Kew.)

***Listrostachys forcipata.** (*G. C.* 1908, xliv. 133; *O. R.* 1908, 275, 276.) Orchidaceae. S. A small plant, with equitant leaves and pellucid white flowers. W. Trop. Africa. (J. Douglas.)

***Listrostachys Kindtiana.** (*G. C.* 1908, xliv. 150; *O. R.* 1908, 276; *J. of H.* 1908, lvii. 185.) S. A dwarf species, with short dense racemes of star-shaped yellowish flowers. Congo. (Sir Trevor Lawrence.)

Listrostachys vandaeformis. (*Orch.* ii. 136.) S. A very large leafy plant. Leaves lorate or linear, unequally 2-lobed at the apex, up to 15 in. long and 1¾ in. broad. Racemes nodding, many-flowered, 10–12 in. long. Flowers yellow. Sepals ovate-lanceolate, acuminate, 7½ lin. long. Petals slightly narrower and shorter than the sepals. Lip rectangular from a cordate base, filiform at the apex, about ½ in. long. W. Trop. Africa. (Berlin-Dahlem B. G.)

***Listrostachys Whytei.** (*G. C.* 1908, xliv. 116; *O. R.* 1908, 275; *J. of H.* 1908, lvii. 136.) S. Racemes decurved, several-flowered. Flowers small, sweet-scented, wax-like, white, with pointed brown-tinted spurs; segments narrow. Uganda. (Sir Trevor Lawrence.)

Lonicera myrtilloides. (*M. D. G.* 1907, 255, t. 9.) Caprifoliaceae. H. A densely and finely branched shrub, 3½–5 ft. high, with pendulous shoots. Leaves shortly petiolate, elliptic or narrowly oblanceolate, usually 1–1¼ in. long and ⅓–⅔ in. broad. Flowers in pairs, axillary, on peduncles much longer than themselves, fragrant, about ½ in. long, white, reddish below, pubescent. Himalaya. (Darmstadt B. G.)

Lupinus polyphyllus Moerheimi. (*J. H. F.* 1908, 473.) Leguminosae. H. Flowers rose, with a bright rose keel. (Fortin & Laumonnier, Paris.)

Lycaste tetragona. *See* **Bifrenaria tetragona.**

Lycium chinense var. **inerme.** (*R. H.* 1908, 200.) Solanaceae. H. A spineless variety. (H. Correvon, Floraire, Geneva.)

Lycopodium pseudo-squarrosum. (*B. T. O.* 1908, 99, t. 2.) Lycopodiaceae. S. Stems regularly 1–4-times dichotomously branched, erect, reflexed at the apex, 1¼–3¼ ft. high, densely leafy. Sterile leaves subverticillate, 12–16 in a whorl, lanceolate-subulate, very acute, ½–¾ in. long, ¼–1 lin. broad, the lower and middle reflexed, the upper spreading; fertile leaves similar to the sterile, but somewhat smaller. Probably Trop. Polynesia. (Florence B. G.)

Magnolia Kobus. var. **borealis.** (*Sargent, T. & S.* ii. 57.) Magnoliaceae. H. Distinguished from the type by its larger leaves, flowers and fruits, and by its arborescent habit. Japan. (Arnold Arboretum.)

Magnolia Soulangeana Niemetzi. (*M. D. G.* 1907, 256.) H. A fastigiate form. (W. F. Niemetz, Temesvár, Hungary.)

Mahonia arguta. (*G. C.* 1908, xliii. 82.) Berberidaceae. G. or H.? Leaves shorter than the inflorescence; leaflets in 5 pairs, lanceolate or oblong-lanceolate, 2–3½ in. long, leathery, spiny at the apex, entire or with 1–3 spiny teeth; petioles 7–8 in. long. Panicles 12–16 in. long, pendulous, lax. Flowers lemon-yellow, small. Sepals 9. Petals 6, oblong, bifid, ⅛ in. long. Berry globose, about ¼ in. across. Native country unknown. (Glasnevin B. G.) [Syn. *Berberis arguta*; Gard. 1908, 481, f.]

Malvastrum hypomadarum. (*G. C.* 1908, xliii. 394, f. 176; xliv. 93, ff. 34–35.) Malvaceae. G. A free-flowering shrub, 2–3 or sometimes up to 10 ft. high, with long slender branches. Leaves varying in size and shape; usually 3-lobed, more or less toothed, softly and sparsely hairy on both sides. Flowers axillary, solitary or 2 or 3 together; pedicels about ¾ in. long. Corolla often about 1½ in. across. Petals obliquely obovate, white, with a rose-purple blotch near the base. A new species which has been in cultivation in Britain under various erroneous names for at least a century. S. Africa. (J. Veitch & Sons; Edinburgh B. G.)

Mammillaria Delaetiana. (*M. K.* 1908, 59, 64, 79, f.) Cactaceae. G. Tufted. Stem club-shaped or cylindric, light green, 3¼ in. high, 2 in. thick, the slightly depressed summit closed up by a little white wool and protected by connivent spines. Tubercles rhomboid at the base, scarcely ½ in. long; axils naked. Radial spines 15, semipellucid, black at the apex; central 1, ¾ in. long, twice as long as the radial and stronger. Flower large, pale yellow. California. (F. De Laet, Contich, Belgium.)

Mammillaria difficilis. (*M. K.* 1908, 107, f.) G. Stem simple, semi-globose, 2½ in. high, 3⅓ in. thick, glaucous green or grey; summit slightly depressed, closed up by a little wool and overtopped by numerous spines. Tubercles almost rhomboid, very oblique, imbricate, up to 1 in. broad; axils sparingly hairy, soon glabrescent. Radial spines 12–14, the upper ¾ in. long, the lower about half as long, spreading horizontally; central 4, ¾ in. long. Flowers and fruits unknown. Mexico. (F. De Laet.)

Mammillaria Joossensiana. (*M. K.* 1908, 95.) G. Stem simple, at first globose, afterwards cylindric, 2 in. high, 1¾ in. thick, pale green; summit slightly depressed, closed up by short white wool and lightly covered with spines. Tubercles conical or sometimes somewhat angular, scarcely ½ in. long; axils glabrous. Radial spines 20, slenderly subulate, up to about ½ in. long, straight; central commonly 4, stronger, up to ⅔ in. long, 1 often hooked. Flowers small, yellow. Mexico. (F. De Laet.)

Mammillaria ramosissima. (*M. K.* 1908, 127, f.) G. Tufted. Stem globose or columnar, 3 in. high, 2½ in. thick; summit flat, almost destitute of wool, protected by spines. Tubercles at first erect, almost rhombic, afterwards imbricate, about ⅔ in. broad; axils shortly woolly. Radial spines usually 12, thin, spreading horizontally, unequal, up to nearly ½ in. long; central 1, very rarely 2 or 3. Flowers and native country unknown. (F. De Laet.)

Maranta Closonii. (*G. C.* 1908, xliii. 234; *R. H.* 1908, 230; *R. H. B.* 1908, 182, 196.) Scitamineae. S. Leaves dark green, variegated with pale yellow. Brazil. (*J. Makoy & Co*, Liége.)

***Masdevallia Ortgiesiana.** (*G. C.* 1908, xliv. 316.) Orchidaceae. G. Leaves linear-oblong, about 4 in. long. Scapes 1-flowered, shorter than the leaves. Flowers scarcely ½ in. long, pale greenish white, with 3 faint purple nerves on each sepal. Sepals narrowed to the apex, but without distinct tails. See *O. R.* 1895, 48, and *Woolward, Masdevallia.* (Glasnevin B. G.; Sir Trevor Lawrence.)

Maxillaria phoenicanthera. (*G. C.* 1908, xliv. 348; *O. R.* 1908, 363.) Orchidaceae. S. A profuse-flowering species, with white or light yellow flowers sparsely spotted with purple. Brazil. (Sir Trevor Lawrence.)

Maxillaria pusilla. (*K. B.* 1908, 415.) S. Pseudobulbs linear-oblong, scarcely ½ in. long, 1-leaved. Leaves linear-lanceolate, 1½–2 in. long, 1½–2½ in. broad. Scapes solitary, very short. Flowers nearly ½ in. long. Sepals and petals oblong or narrowly oblong, brownish green, somewhat darker at the base. Lip nearly entire, obtuse, dark purple and very shining, lighter at the apex. Country unknown. (F. Sander & Sons.)

Meconopsis sinuata** var. ***latifolia. (*B. M.* t. 8223.) Papaveraceae. H. Very similar to *M. aculeata*, differing in having less lobed leaves and obconical capsules. Herb 1–4 ft. high, covered with spreading prickles. Leaves oblong, 4–7 in. long, 1½–2 in. broad, obtuse, irregularly shallowly lobed or sinuate, the lower petiolate, the upper sessile. Flowers in raceme-like cymes. Petals 4, blue, 1½ in. long, 1¼ in. broad. Himalaya. (Kew.) [This is *M. sinuata* of G. C. 1908, xliv. 202, f. 88. The type is not in cultivation.]

***Megaclinium eburneum.** (*Orch.* ii. 134.) Orchidaceae. S. Pseudobulbs narrowly ovate, obtusely 4-or 3-angled. Leaves sessile, oblong. Scape as long as the leaves, slender; rhachis about as long as the scape, irregularly dilated. Flowers (and rhachis) yellowish white, with the ends of the petals and the dorsal sepal yellow. W. Africa. (Prince Liechtenstein, Eisgrub, Austria.)

Mesembryanthemum Bosscheanum. (*J. S. H. T.* vi. 109, t. 230.) Ficoideae. G. Leaves 6–15, in a basal rosette, straight, lanceolate, 1¾ in. long, scarcely ½ in. broad, more or less flat above, rounded on the back, with 2 or 3 coarse sharp irregular teeth each side. Flowers solitary, sessile, 1¼–1½ in. across. Petals linear-spathulate, golden-yellow, arranged in about 3 series. S. Africa. (L. van den Bossche, Tirlemont, Belgium; La Mortola.)

***Mesembryanthemum sexpartitum.** (*K. B.* 1908, 407.) G. Densely branched, about 3¼ in. high. Leaves very much crowded or up to ¾ in. apart on the flowering branches, subacutely trigonous, ¾–2 in. long, scarcely ¼ in. broad and thick. Flowers terminal, solitary, sessile. Sepals 6. Petals whitish yellow, in 5 or 6 series, the outer up to ¾ in. long and ⅓ in. broad, the inner gradually smaller. S. Africa. (Kew.) [*M. Lehmanni*, Eckl. & Zeyh.]

Miltonia Bleuana Stevensii. (*G. C.* 1908, xliii. 391; *Gard.* 1908, 298; *G. M.* 1908, 478.) Orchidaceae. S. A dwarf floriferous variety. Flowers white, with a rose-lilac blotch at the base of each petal and numerous crimson stripes on the lip. (W. Thompson.)

Montanoa tomentosa var. **cordifolia.** (*G. C.* 1908, xliv. 23.) Compositae. G. A shrub about 7 ft. high. Leaves cordate, densely toothed. Flower-heads in large axillary clusters at the ends of the branches, small, with 5 ray-florets. Mexico. (Villa Thuret, Antibes, France.)

Moraea iridioides var. **Johnsonii.** (*G. C.* 1908, xliii. 338.) Iridaceae. G. Differs from the type in having longer leaves, 2½ ft. long, erect instead of spreading obliquely, and flowers 4 in. across. South Africa. See *G. C.* 1907, xli. 296, f. 121. (Mrs. J. L. Richmond.)

***Mussaenda erythrophylla.** (*B. M.* t. 8222.) Rubiaceae. S. Shrub suberect or climbing to a height of 40 ft. or more. Leaves variable, lanceolate to nearly orbicular, up to 6–7 in. long including petiole. Flowers about 1¼ in. across, yellow within changing to red, crimson in the centre, arranged in dense terminal cymes. Calyx-lobes 5, all small and lanceolate, or 1 leaf-like, oval, up to 5 in. long and 4 in. broad and coloured a brilliant crimson. A reintroduction. First introduced in 1863, and again in 1886. Tropical Africa. (Kew.)

Nepenthes excelsa. (*G. C.* 1908, xliii. 410.) Nepenthaceae. S. A garden hybrid between *N. Veitchii* and *N. sanguinea.* (J. Veitch & Sons.)

***Nepenthes Sanderiana.** (*R. H. B.* 1908, 194, as *N. Sanderii.*) S. Described as being similar to *N. Rafflesiana* in the shape and size of its pitchers, but these are more brightly coloured, and the plant has a more compact habit of growth. Sumatra. See *Flora & Sylva*, 1904, 113; 1905, 280, col. t. (F. Sander & Sons.) [=*N. Rafflesiana*, Jack.]

Nephrodium gracillimum. (*G. C.* 1908, xliii. 258: *R. H.* 1908, 230; *Gfl.* 1908, 326.) Filices. G. A variety of *N. decompositum* characterized by its finely divided pinnules. Australia. (F. Sander & Sons.)

Nephrolepis amabilis. See **N. rufescens amabilis.**

Nephrolepis Barrowsii. (*Lemoine Cat.* 1908–9, n. 170, 3.) Filices. S. Appears to be a form of *N. exaltata* and is described as being superior to the form *N. Piersoni.* The broad erect fronds have bipinnatisect dark green pinnae. (V. Lemoine & Son, Nancy.)

Nephrolepis rufescens amabilis. (*G. C.* 1908, xliv. 347.) S. Supposed to have originated from *N. rufescens Mayi.* Fronds gracefully arching, 2–2½ ft. long, narrow, with all the pinnae crested or tasselled. (J. Hill & Son.) [Syn. *N. amabilis*; G. M. 1908, 849. 876, f.; G. W. 1908, 747.]

***Nigella integrifolia.** (*G. C.* 1908, xliv. 226, f. 98; *B. M.* t. 8245.) Ranunculaceae. H. A slender annual herb, about 1 ft. high. Leaves linear-spathulate or linear, up to 4 in. long or more, entire or 3–9-palmatipartite, with linear lobes, the uppermost forming an involucre around the flower. Flowers blue, campanulate, ¾–1 in. long Turkestan. (Kew; W. E. Gumbleton.) [Syn. *N. diversifolia*, Franch.]

Odontioda Charlesworthii. (*G. C.* 1908, xliii. 353, f. 161; *O. R.* 1908, 185; *Gard.* 1908, 301, f.; *G. M.* 1908, 439.) Orchidaceae. G. A garden hybrid between *Odontoglossum Harryanum* and *Cochlioda Noetzliana.* (Charlesworth & Co.)

Odontioda Craveniana. (*G. C.* 1908, xliii. 14; *O. R.* 1908, 33, 43; *G. M.* 1908, 25, f.) G. A garden hybrid between *Cochlioda Noetzliana* and *Odontoglossum cordatum.* (Charlesworth & Co.)

Odontioda keighleyensis. (*G. C.* 1908, xliii. 211.) G. A garden hybrid between *Cochlioda Noetzliana* and *Odontoglossum cirrhosum.* (Charlesworth & Co.)

Odontioda Thwaitesii. (*G. C.* 1908, xliv. 76; *O. R.* 1908, 247; *G. M.* 1908, 588; *J. of H.* 1908, lvii. 88, 147, f.) G. A garden hybrid between *Cochlioda vulcanica* and *Odontoglossum Harryanum.* (R. G. Thwaites.)

Odontioda wickhamensis. (*G. C.* 1908, xliii. 422; *O. R.* 1908, 204; *G. M.* 1908, 521.) G. A garden hybrid between *Odontoglossum crispum* and *Cochlioda sanguinea.* (G. W. Bird.)

Odontoglossum apterum Mossiae. (*J. of H.* 1908, lvi. 456; *Gard.* 1908, 250.) Orchidaceae. G. Flowers very large, pure white, with a yellow crest on the lip. (J. S. Moss.) [Syn. *O. nebulosum Mossiae*; G. C. 1908, xliii. 321; G. M. 1908, 392.]

Odontoglossum Bingelianum. (*G. C.* 1908, xliii. 45; *O. R.* 1908, 43; *G. M.* 1908, 69, 70, f.) G. A garden hybrid of unrecorded parentage. Flowers large, canary-yellow or greenish-yellow, barred and blotched with light reddish-brown. Lip white, with a large brown blotch in front of the crest. (Baron Sir H. Schröder.) [Syn. *O. hybridum Bingleianum*; J. of H. 1908, lvi. 65, 123, f.]

Odontoglossum crispum Chapmaniae. (*O. R.* 1908, 116.) G. Flowers well-shaped, tinged with rose and handsomely blotched. (N. C. Cookson.)

Odontoglossum crispum coloratum. (*O. R.* 1908, 151.) G. A very richly coloured form, with well-toothed petals. (F. Lambeau, Brussels.)

Odontoglossum crispum maculatum. (*J. H. F.* 1908, 702.) G. Petals marked with 2 elongated somewhat bright red blotches. The sepals bear several smaller blotches. (H. Vacherot, Boissy St. Léger, France.)

Odontoglossum crispum rotundum. (*G. C.* 1908, xliii. 178.) G. Flower circular. Sepals and petals broadly ovate, bright violet-purple outside, with a reddish margin, blotched inside with purple. Lip blotched with chestnut-brown. (J. G. Fowler.)

Odontoglossum exultans var. **formosum.** (*G. C.* 1908, xliii. 77.) G. A garden hybrid between *O. crispum* and *O. excellens.* (Linden & Co., Brussels.)

Odontoglossum gemmatum. (*O. R.* 1908, 158.) G. A garden hybrid between *O. elegans* and *O. triumphans latisepalum.* (F. Sander & Sons.)

Odontoglossum gloriosum citrinum. (*G. C.* 1908, xliii. 391; *G. M.* 1908, 478.) G. Flowers pale citron-yellow, with marks of darker yellow or faint green instead of the usual brown spots. (J. & A. A. McBean.) [Syn. *O. gloriosum delicatulum*; Gard. 1908, 298.]

Odontoglossum Groganiae. (*G. C.* 1908, xliv. 381; *O. R.* 1908, 364; *G. M.* 1908, 916.) G. A garden hybrid between *O. Edwardii* and *O. Uro-skinneri.* (J. H. Grogan.)

Odontoglossum Harryano-elegans. (*G. C.* 1908, xliii. 312.) G. A garden hybrid between *O. Harryanum* and *O. elegans.* (F. Sander & Sons.)

Odontoglossum hibernicum. (*G. C.* 1908, xliii. 353; *O. R.* 1908, 182, 186; *G. M.* 1908, 440.) G. A garden hybrid between *O. Hallii* and *O. hastilabium.* (Charlesworth & Co.)

Odontoglossum Lairessei. (*G. C.* 1908, xliii. 328, f. 147.) G. A garden hybrid between *O. Cervantesii roseum* and *O. Edwardii.* (A. de Lairesse, Liége.)

Odontoglossum laudatum. (*G. C.* 1908, xliii. 353; *O. R.* 1908, 184; *G. M.* 1908, 440.) G. A garden hybrid of unrecorded parentage. (C. Vuylsteke, Loochristi, Ghent.)

Odontoglossum MacNabianum. (*G. C.* 1908, xliii. 45; *O. R.* 1908, 44; *G. M.* 1908, 57, 70, f.) G. A garden hybrid between *O. Harryanum* and *O. Wilckeanum albens.* (F. Sander & Sons.)

Odontoglossum maculatissimum. (*G. C.* 1908, xliii. 284, 362, f. 164; *O. R.* 1908, 169, f. 22; *R. H.* 1908, 292.) G. A garden hybrid between *O. maculatum* and *O. ardentissimum.* (C. Vuylsteke, Loochristi, Ghent.)

Odontoglossum Mooreanum. (*G. C.* 1908, xliv. 452.) G. An elegant species, probably nearest to *O. Kranzlinii*, with flowers somewhat resembling those of *O. ramosissimum.* (F. Sander & Sons.)

Odontoglossum nethernense. (*O. R.* 1908, 158.) G. A garden hybrid between *O. Hunnewellianum* and *O. nobile* (*Pescatorei*). (R. G. Thwaites.)

Odontoglossum Notteanum. (*G. C.* 1908, xliii. 77; *O. R.* 1908, 73.) G. A garden hybrid between *O. loochristiense* and *O. Wilckeanum.* (Linden & Co., Brussels.)

Odontoglossum Pescatorei Sanderae. (*G. C.* 1908, xliv. 285; *G. M.* 1908, 785, 807, f.; *Gard.* 1908, 527.) G. Flowers large, with very broad segments. Sepals and petals white, blotched and spotted on the lower half with light brown. Lip large, flat, white, with yellow crest and some fine purple lines at the base. (F. Sander & Sons.)

Odontoglossum platycheilum superbum. (*G. C.* 1908, xliii. 290; *O. R.* 1908, 170; *G. M.* 1908, 359.) G. Spikes usually 2-flowered. Flowers soft pink, with deep rose spots on the lip. (Sir Trevor Lawrence.)

Odontoglossum Wardiae. (*O. R.* 1908, 366.) G. A garden hybrid between *O. crispum Lucienianum* and *O. Vuylstekei.* (Z. A. Ward.)

Odontoglossum Wardii. (*G. C.* 1908, xliv. 149; *O. R.* 1908, 277.) G. A garden hybrid between *O. Kegeljanii* and *O. Harryanum.* (De B. Crawshay.)

***Olearia ciliata.** (*B. M.* t. 8191.) Compositae. G. A twiggy bush 1–2 ft. high. Leaves crowded, recurved, linear, ½–1 in. long, about $\frac{1}{12}$ in. broad, long-ciliate. Flower-heads solitary and terminal on each branch, about 1 in. across, lilac, resembling those of an *Aster.* W. Australia. (Kew.)

***Olearia ramulosa** var. **communis.** (*B. M.* t. 8205.) G. This is the name of the plant which has been cultivated for many years as *O. ramulosa*. It differs from the type in having longer leaves and smaller fewer flower-heads. E. & S. Australia; Tasmania. (Kew.)

Omphalodes florariensis. (*R. H.* 1908, 230; *R. H. B.* 1908, 195; *Gfl.* 1908, 327.) Boraginaceae H. A garden hybrid between *O. Luciliae* and *O. nitida*. (H. Correvon, Floraire, Geneva.)

Opuntia albispino-rhodantha salmonea. (*M. D. G.* 1907, 257.) Cactaceae. G. A garden hybrid between *O. camanchica albispina* and *O. rhodantha*. (L. Späth, Berlin.)

Opuntia albispino-xanthostema rubra. (*M. D. G.* 1907, 257.) G. A garden hybrid between *O. camanchica albispina* and *O. xanthostema*. (L. Späth, Berlin.)

Opuntia haitiensis. (*S. M. C.* l. 513.) G. Trunk 10-13 ft. high, somewhat flattened above, branched at the top, densely armed with spines 5 in. long or less, woolly at the base of the spines; branches obliquely linear-oblong to obovate; areolae elevated, 5–7½ lin. apart, with 1–8 spines, or sometimes spineless. Flowers yellow to orange, about 1 in. broad. Ovary with brown glochidia, but spineless. It is doubtful whether this is the same as *O. ferox*, Haw. = *Cactus ferox*, Willd. Haiti. (New York B. G.)

Opuntia Millspaughii. (*S. M. C.* l. 513.) G. Trunk terete, 2 ft. high or less, 3 in. thick at the base, branched at the top, densely covered with spines sometimes 6 in. long; branches divaricate-ascending, narrowly oblong, much compressed, up to 16 in. long; areolae about 5 lin. apart, those on the edges bearing spines shorter than those on the trunk. Flowers cup-shaped, crimson lake, scarcely ½ in. across. Fruit with yellow-gray spines ¾ in. long or less. Bahamas. (New York B. G.)

Opuntia Spegazzinii. (*B. K.* t. 103.) G. Stem and branches cylindric. Spines 5 or 6, short, whitish. Flowers small, numerous, white. Fruit pear-shaped or club-shaped, deep crimson, often bearing at the apex 1 or more globose green spiny shoots. Paraguay. (Berlin-Dahlem B. G.) [Syn. *O. albiflora*, K. Schum.]

Opuntia Taylori. (*S. M. C.* l. 520.) G. Prostrate, widely branched; joints oblong to narrowly obovate, up to 5 in. long, 1¼–1¾ in. broad; areolae 5–7½ lin. apart, each with 3–6 needle-like spines 1¾ in. long or less. Flowers small, yellow. Ovary with a few bristles, spineless. Haiti. (New York B. G.)

***Paeonia decora alba.** (*G. C.* 1908, xliii. 359; *G. M.* 1908, 439; *Gard.* 1908, 291, f.) Ranunculaceae. H. Flowers satin-white, slightly tinted with pink. Stamens yellow. (R. Wallace & Co.)

***Paeonia Mlokosewitschii.** (*B. M.* t. 8173; *G. C.* 1908, xliv. 70, f.) H. A robust herbaceous perennial. Leaves biternate; leaflets broadly oblong or subelliptic, 3-4 in. long, 1½–2½ in. broad, bluish-green above, pale glaucous below, red on the margins and nerves. Flowers open, 4-5 in. across, yellow, with deeper yellow stamens and purple stigmas. Caucasus. (W. E. Gumbleton.)

Paphiopedilum Frankeanum. (*O. R.* 1908, 29.) Orchidaceae. S. Apparently a natural hybrid between *P. Curtisii* and *P. tonsum*. (Th. Franke, Gross-Ottersleben, Magdeburg, Germany.)

***Paulownia Fargesii.** (*B. S. D. F.* 1908, 161.) Scrophulariaceae. H. Resembles closely *P. imperialis*, but its leaves are shorter and broader, and its flowers white, with a differently-shaped calyx. Central China. (G. Boucher, Paris; M. L. de Vilmorin, Les Barres, France.)

Paulownia imperialis var. **lanata.** (*B. S. D. F.* 1908, 161.) Much more woolly-pubescent than the type, and the calyx has narrower lobes. Central China. (M. L. de Vilmorin, Les Barres, France.)

***Pennisetum japonicum.** (*G. C.* 1908, xliv. 253; *G. M.* 1908, 760; *Gard.* 1908, 501.) Gramineae. H. A perennial. Leaves very narrow, 2½-3 feet long. Inflorescences 3 in. long or more, enveloped with reddish-violet bristles or awns, and bearing a tuft of white ones at the apex. Japan. (A. Perry.) [*P. compressum*, R. Br.]

Pereskia Godseffiana. (*G. C.* 1908, xliii. 257, f. 114; *R. H.* 1908, 229: *Gfl.* 1908, 326.) Cactaceae. G. A variety of *P. aculeata*, remarkable for the rich coloration of the leaves; when young they are crimson, apricot-yellow and green above, purplish-crimson beneath. It is supposed to have originated in Queensland. (F. Sander & Sons.)

Phellodendron amurense albo-variegatum. (*M. D. G.* 1907, 256.) Rutaceae. H. Leaves variegated, but not constantly, with large white blotches. (Fritz Graf v. Schwerin, Wendisch-Wilmersdorf, Germany.)

Philodendron Duvivieri. (*R. H.* 1903, 230; *Jard.* 1903, 152; *R. H. B.* 1908, 196, 253.) Araceae. S. Leaves broadly and deeply lobed. Brazil. (L. De Smet-Duvivier, Mont St. Amand, Belgium.)

Philodendron Ilsemanii. (*G. C.* 1908, 257, 289, f. 130; *R. H.* 1908, 229; *R. H. B.* 1908, 193.) S. Pcssibly a form of *P. rubescens* or *P. sagittifolium*, but it is known only in the juvenile stage. Leaves oblong, cordate at the base, dark green, marbled with white, and sometimes, especially when immature, tinged with rose-pink. Brazil. (F. Sander & Sons.)

Phormium atropurpureum nanum. (*Jard.* 1908, 152; *R. H. B.* 1908, 196; *G. C.* 1908, xliii. 284.) Liliaceae. G. A dwarf form of *P. tenax atropurpureum*. (L. De Smet-Duvivier, Mont St. Amand, Belgium.)

Picea albertiana. (*M. D. G.* 1907, 69.) Coniferae. H. Differs from *P. canadensis* in having shorter broader and darker coloured cones, with broadly rounded scales and minute sharply angled bracts. Alberta; British Columbia. (Baron von Feurstenberg, Coesfeld, Westphalia.)

Picea excelsa cupressina. (*M. D. G.* 1907, 252, t. 8.) H. A fastigiate form, the specimen described resembling a gigantic *Cupressus*. (Friedhof zu Tambach, Gotha.)

Pinanga Micholitzii. (*G. C.* 1908, xliii. 257, f. 113; *R. H.* 1908, 229; *R. H. B.* 1908, 194; *Gfl.* 1908, 326.) Palmae. S. An elegant dwarf species reaching a height of 6 ft. Stems slender, tufted, bulbous at the base. Leaves about 3 ft. long, slender, arching; petioles sheathing, dotted with blackish scurf; leaflets 15 in. long, rich green, blotched with yellow above, glaucous-green beneath, tinted with purple when young. Sumatra. (F. Sander & Sons.)

Pleione pogonioides. (*G. C.* 1908, xliii. 190; *J. of H.* 1908, lvi. 274.) Orchidaceae. G. "A pretty dwarf species with rose-coloured flowers." China. [Not the true plant, but *P. yunnanensis*, Rolfe.]

Pleurothallis apiculata. (*Orch.* ii. 40.) Orchidaceae. G. Stems aggregated, 1⅛–1¼ in. long, slender. Leaves linear-lanceolate, 1-2 in. long. Racemes about as long as the leaves, 3-5-flowered. Flowers pale yellow, only about ¼ in. long. Venezuela. (O. Beyrodt, Marienfelde, Berlin.)

Pleurothallis subulifolia. (*Orch.* ii. 91.) G. Stem slender, 1¾ in. long. Leaves subulate, nearly 2 in. long, ⅛ in. thick. Racemes slightly longer than the leaves, 5-flowered or more. Flowers about ¼ in. long, yellow, with purple lines. Brazil. (Mrs. Ida Brandt, Riesbach, Zurich.)

Pollia condensata var. **variegata.** (*R. H. B.* 1908, 407, t.) Commelinaceae. S. The long oblong-lanceolate leaves are dark green, variegated with yellowish white. Trop. Africa. (Brussels B. G.)

Polystachya flexuosa. (*G. C.* 1908, xliv. 150, 276, f. 120; *O. R.* 1908, 276.) Orchidaceae. S. Pseudobulbs about 6 in. high, bearing on the upper part bright green leaves nearly as long. Scape slender, about 1 ft. long, terminated by a lax raceme of small white flowers with a purple-spotted lip. East Tropical Africa. (Sir Trevor Lawrence.) [= *Cyrtopera flexuosa*, Rolfe, in List of 1894. = *Eulophia flexuosa*, Gilg.]

***Polystachya Laurentii.** (*G. C.* 1908, xliv. 348; *O. R.* 1908, 363.) S. A trailing plant, with fleshy green leaves and panicles of white or cream-white flowers. Congo. (Sir Trevor Lawrence.)

Polystichum falcatum var. **Mayi.** *See* **Aspidium.**

Populus canescens pendula. (*M. D. G.* 1907, 256.) Salicaceae. H. A very fine form with pendulous branches. (Copenhagen B. G.)

***Populus Thevestina.** (*M. D. G.* 1907, 67.) H. A very large tree, pyramidal in shape; bark grey; young branches yellowish; buds brown. Leaves very large, almost triangular, undulate, toothed, shining, motile; petioles carmine. Morocco. (C. Sprenger, Vomero, Naples.)

Populus tremula pyramidalis. (*M. D. G.* 1907, 24.) H. A slender pyramidal form. (Lund B. G.)

***Potentilla concolor.** (*B. M.* t. 8180.) Rosaceae. H. A perennial herb more than 1 ft. high. Cauline leaves petiolate or the upper subsessile, pinnate or the upper trifoliolate; leaflets obovate elliptic, 1-2 in. long, deeply toothed. Cymes lax, few-flowered. Flowers more than 1½ in. across, deep yellow, with an orange-coloured blotch at the base of each petal. Yunnan, China. (Bees, Ltd.)

Primula angustidens. (*G. C.* 1908, xliv. 16.) Primulaceae. H. Closely allied to *P. Poissonii*. Flowers deep clear purple, drooping, borne in several superposed whorls on rigid erect scapes. Yunnan, China. (J. Veitch & Sons.)

Primula malacoides. (*G. C.* 1908, xliv. 381, 397, ff. 164–165; *G. M.* 1908, 914, 916, f., *N. B. G. Edinb.* iv. 218, t. 28B.) G. or H. Resembles *P. Forbesii*, but it is a larger plant and much more freely branched. Flowers ½–¾ in. across, pink, with a yellowish eye, borne in superposed whorls on slender mealy scapes. Yunnan, China. (Bees, Ltd.)

Primula obconica coerulea. (*J. H. F.* 1907, 574.) G. Flowers blue. (L. Férard, Paris.)

Primula obconica gigantea. (*Jard.* 1908, 123.) G. A fine form, with broad rounded undulate leaves and lilac rose or carmine flowers, which often exceed 1¾ in. across. (Cayeux & Le Clerc; L. Férard, Paris.)

Prunus Pissardi var. **nigra.** (*J. H. F.* 1908, 203.) Rosaceae. H. Leaves very much more purple than in the type. (A. Brochet, Châtenay, Seine, France.) [A form of *P. cerasifera*, Ehrh., var. *atropurpurea*, Dieck.]

Pteris aquilina Nicholsonii. (*G.C.* 1908, xliv. 190; *G. M.* 1908, 714; *G.W.* 1908, 618.) Filices. H. A very slender graceful variety, with narrow drooping fronds about 3 ft. long, 2- or 3-times pinnate; pinnules narrowly linear. New Zealand. (H. B. May & Sons.)

Pteris Lauwaerti. (*T. H.* 1908, 467.) G. Intermediate between *P. tremula* and *P. serrulata*. (M. Lauwaert, Nivelles, Belgium.)

***Pterocarya Rehderiana.** (*Sargent, T. & S.* ii. 79, t. 137.) Juglandaceae. H. A garden hybrid between *P. fraxinifolia* and *P. stenoptera*. See List of 1903. (Arnold Arboretum.)

Ptychoraphis Siebertiana. (*G. C.* 1908, xliii. 257, suppl. ill.; *R. H.* 1908, 229; *Gfl.* 1908, 325.) Palmae. S. An elegant species resembling a *Kentia*. Stems slender, probably tufted in mature plants. Leaves arching, copper-coloured when young, afterwards rich green; petiole clothed with small brownish scales; leaflets 10 in. long, ¾ in. broad, tapering to a long thread-like point. Malaya. (F. Sander & Sons.) [Syn. *Kentia Siebertiana*; R. H. B. 1908, 193.]

***Raphionacme utilis.** (*K. B.* 1908, 209, t.; *B. M.* t. 8221.) Asclepiadaceae. S. Economically important on account of the large quantity of rubber, said to be of good quality, yielded by its large turnip-shaped tubers. Stems annual, 1–4 in. long. Leaves in 2–5 pairs or forming a rosette close to the ground, orbicular to oblong-ovate, 1¼–3⅓ in. long. Flowers in small terminal and axillary cymes. Corolla bright purple, about ½ in. across. Angola. (Kew.)

Rehmannia angulata tigrina. (*Gfl.* 1908, 618.) Scrophulariaceae. H. H. A garden hybrid of which *R. angulata* is one of the parents. (Ver. z. Beförderung des Gartenb., Berlin.)

Rhamnus Frangula aureo-variegata. (*M. D. G.* 1907, 256.) Rhamnaceae. H. Some of the leaves variegated with large yellow blotches. (Fritz Graf v. Schwerin, Wendisch-Wilmersdorf, Germany.)

***Rheum inopinatum.** (*B. M.* t. 8190.) Polygonaceae. H. A small plant with grey-green somewhat bullate leaves which are conspicuously red-veined. Inflorescence paniculate, bright red or crimson. Nutlets orbicular, 3-winged, rather bright red, nearly ½ in. across. Tibet. (Kew.)

***Rhipsalis chloroptera.** (*B. K.* t. 104.) Cactaceae. S. Stem with broad rhomboid or elliptic joints. Flowers about ¾ in. across, yellowish white, with pure white filaments. Probably Brazil.

Rhodazalea Crouxii. (*J. H. F.* 1908, 228, f. 12; *R. H.* 1908, 339.) Ericaceae. H. A hybrid between a garden *Rhododendron* and a variety of *Azalea mollis* [*Rhododendron sinense.*] (Croux & Son, Châtenay, Seine, France.) [Syn. *Azaleodendron Crouxii*; Jard. 1908, 224.]

Rhododendron albiflorum f. plenum. (*M. D. G.* 1907, 75.) Ericaceae. H. Flowers about ¾ in. across, double, all the stamens being petaloid. British Columbia. (Arnold Arboretum.)

***Rhododendron Maddeni** var. **obtusifolium.** (*B. M.* t. 8212.) G. Differs from the type in having the leaves rounded at apex and base, and in the longer calyx-lobes. Assam. (Kew.)

Rhododendron racemosum var. **rigidum.** (*Gfl.* 1908, 561, f. 68, t. 1577, ff. 2–4.) H. A very dwarf plant with short rigid branches, small

leaves, and small pale rose, rose or dark red flowers, which are produced in bunches at the ends of the shoots. The short branches and the arrangement of the flowers distinguish it from *R. racemosum*. Yunnan, China. (Giessen B. G.) [*R. rigidum*, Franch.]

Rhus copallina var **extensa.** (*M. D. G.* 1907, 67.) Anacardiaceae. H. Leaves oval, decurrent, shining, dark green, becoming scarlet in the autumn. Fruits shining red. New Jersey. (C. Sprenger, Vomero, Naples.)

Rhus semialata var **purpurea.** (*M. D. G.* 1907, 67.) H. The large leaves when young are reddish green. Central China. (C. Sprenger.)

***Rhus sinica.** (*G. M.* 1908, 419, f. only.) H. A shrub with pinnate leaves 10–17 in. long. Leaflets in 4–6 pairs, ovate-oblong, 4–5 in. long, acute or acuminate, subcordate at the base, coarsely toothed. Flowers very small, in a panicle up to 12 in. long and 10 in. broad. See *Engl. Bot. Jahrb.* xxix. 432. China. (Paul & Son, Cheshunt.)

Rhus vernicifera columnaris. (*M. D. G.* 1907, 256.) H. A fastigiate form. (Park zu Augny, Metz.)

Ribes Giraldii. (*Späth Cat.* 1908-9, n. 130, 121.) Saxifragaceae. H. A dwarf species with long slender spreading branches bearing short spines and velvety-green leaves. Young shoots with purple cortex. Flowers greenish, in racemes 2½ in. long. Berries red. N. China. (L. Späth, Berlin.)

Robinia Kelseyi. (*G. C.* 1908, xliv. 426, f. 174; *B. M.* t. 8213.) Leguminosae. H. Similar to *R. hispida*, but the leaflets are narrower and the flowers smaller. Shrub 3–10 ft. high. Leaves pinnate; leaflets in 4 or 5 pairs, oblong-lanceolate, ½–1½ in. long, ⅓–½ in. broad. Racemes 5–8-flowered, up to 3½ in. long. Corolla rose-coloured, the standard erect and about 1 in. across. N. America. (Kew.)

***Rodgersia tabularis.** (*G. C.* 1908, xliv. 210, f. 89.) Saxifragaceae. H. A handsome foliage plant. Leaves peltate, irregularly lobed, about 1 ft. across; petioles 2–3 ft. long, covered with stiff white hairs which are dark at the base. Flowering-stems about 3 ft. high, bearing an arching panicle of white flowers. N. China; Corea. (Kew.)

Rosa Freundiana. (*Gfl.* 1908, 470, f. 60.) Rosaceae. H. Apparently a hybrid between *R. moschata* and *R. gallica*. (Berlin-Dahlem B. G.)

***Rosa Moyesii.** (*G. C.* 1908, xliii. 390; *Gard.* 1908, 318, f.; *G. M.* 1908, 478, f.) H. Stems very prickly. Leaves up to 7 in. long; leaflets 7-13, often 9 or 11, elliptic or elliptic-lanceolate, prickly beneath. Flowers solitary at the ends of short lateral shoots, 2–2¾ in. across, ruby-red. Petals somewhat fleshy. Fruit red, ovoid, 1¼ in. long, crowned by the persistent erect calyx-segments. See *K. B.* 1906, 159. W. China. (J. Veitch & Sons.)

Rosa multiflora var. **hupehensis.** (*M. D. G.* 1907, 68.) H. A very luxuriant form, with large bunches of pale rose flowers. Central China. (C. Sprenger, Vomero, Naples.)

Rosa yedoensis. (*G. C.* 1908, xliii. 386.) H. Similar to *R. rugosa* in foliage and to *R. multiflora* in inflorescence, the flowers being numerous, rather small, and pink. Japan.

***Rubus coreanus.** (*Späth. Cat.* 1908–9, n. 130, 123; *M. D. G.* 1907, 68.) Rosaceae. H. Stems erect, about 6 ft. high, hoary; young shoots dark brown. Leaves with 2 or 3 pairs of light green leaflets. Flowers rose or purple, in very large terminal panicles. China; Corea. (L. Späth, Berlin; C. Sprenger, Vomero, Naples.)

Rubus Parkeri. (*Späth. Cat.* 1908–9, n. 130, 123.) H. Plant thickly and softly glandular-hairy. Stems long and slender. Leaves often in 2 rows, undivided, ovate-lanceolate, about 3 in. long, deeply cordate at the base, rugose, a peculiar velvety dull green, brown on the young shoots. China. (L. Späth, Berlin.)

Rudbeckia fulgida compacta. (*Gfl.* 1908, 621.) Compositae. H. A dwarf compact-growing form. (Ver. z. Beförderung des Gartenb., Berlin.)

Saccolabium dasypogon. (*G. C.* 1908. xliv. 316; *O. R.* 1908, 342.) Orchidaceae. S. A pretty species allied to *S. bellinum*. Sepals and petals yellow. Lip white, with purple markings. Nepal. (Sir Trevor Lawrence.)

***Salix Safsaf.** (*M. D. G.* 1907, 68.) Salicaceae. G. A fine tree with pendulous branches, the younger with pale green bark, and light green leaves, shining silvery grey beneath. Introduced into Italy many years ago. N. & Trop. Africa.

Sambucus canadensis delicatissima. (*M. D. G.* 1907, 256.) Caprifoliaceae. H. Leaves lustrous golden-yellow. Berries pale cherry-red, distinctly paler than in the type. (Fritz Graf v. Schwerin, Wendisch-Wilmersdorf, Germany.)

Sambucus nigra nana. (*M. D. G.* 1907, 256.) H. A weak-growing variety forming a globose bush about 3 ft. high. (Fritz Graf v. Schwerin.)

***Sanchezia parvibracteata.** (*K. B.* 1908, 253.) Acanthaceae. S. Near to *S. nobilis* from which it differs by having wingless petioles, smaller bracts with fewer (3–5) flowers, and longer staminodes. Corolla yellow, about 2 in. long. Trop. America. (Kew.)

Sapindus Drummondii. (*M. D. G.* 1907, 74.) Sapindaceae. H.? A tree reaching a height of about 50 ft. Leaves glabrous or slightly pubescent beneath; leaflets 7–19, obliquely lanceolate, often falcate, 1¼–4 in. long, acuminate. Panicles terminal, 4–8 in. long, dense. Flowers white, only about ⅛ in. across. S. United States; Kansas; Northern Mexico. (Arnold Arboretum.)

***Sarcococca ruscifolia.** (*G. C.* 1908, xliv. 452; *J. of H.* 1908, lvii. 623.) Euphorbiaceae. A dwarf evergreen shrub, with bright green shining leaves about 1 in. long, resembling those of a *Ruscus*. Flowers small, fragrant, whitish, produced in small axillary clusters. Fruits bright blue. China. (J. Veitch & Sons.)

***Saxifraga ambigua.** (*G. C.* 1908, xliii. 277.) Saxifragaceae. H. A natural hybrid between *S. media* and *S. aretioides*. Pyrenees. (F. Sundermann, Lindau, Bavaria.)

***Saxifraga Bertolonii.** (*G. C.* 1908, xliii. 277.) H. A garden hybrid between *S. thessalica* and *S. porophylla*. (F. Sundermann.)

***Saxifraga Borisii.** (*G. C.* 1908, xliii. 277.) H. A garden hybrid between *S. marginata* and *S. Ferdinandi-Coburgi*. (Sofia Court G.; F. Sundermann.)

***Saxifraga Burnatii.** (*G. C.* 1908, xliii. 277.) H. A natural hybrid between *S. cochlearis* and *S. Aizoon*. Maritime Alps. (F. Sundermann.)

***Saxifraga eudoxiana.** (*G. C.* 1908, xliii. 277.) H. A garden hybrid between *S. Ferdinandi-Coburgi* and *S. sancta*. (Sofia Court G.; F. Sundermann.)

***Saxifraga Kyrillii.** (*G. C.* 1908, xliii. 277.) H. A garden hybrid between *S. marginata* and *S. Ferdinandi-Coburgi*. It is more like *S. marginata*, while *S. Borisii*, with the same parentage, is nearer *S. Ferdinandi-Coburgi*. (Sofia Court G.; F. Sundermann.)

***Saxifraga Obristii.** (*G. C.* 1908, xliii. 277.) H. A garden hybrid between *S. Burseriana* and *S. marginata*. (F. Sundermann.)

***Saxifraga Paulinae.** (*G. C.* 1908, xliii. 277.) H. A garden hybrid between *S. Burseriana minor* and *S. Ferdinandi-Coburgi*. (F. Sundermann.)

***Saxifraga Petraschii.** (*G. C.* 1908, xliii. 277, f. 121.) H. A garden hybrid between *S. tombeanensis* and *S. Rocheliana*. (F. Sundermann.)

Saxifraga Vetteriana. (*B. H. B.* 1908, 226.) H. A spontaneous hybrid between *S. hederacea* and *S. Huetiana*. (Hort. Boissier, Valleyres, Switzerland.)

Scaphyglottis alba. (*K. B.* 1908, 415.) Orchidaceae. S. Stems fascicled, narrowly spindle-shaped, 1¾–2 in. long, 2-leaved. Leaves linear, 1¾–2½ in. long, minutely bilobed at the apex. Flowers small, white, in fascicles of 3 or 4. Sepals oblong, ⅛ in. long, subconnivent. Petals somewhat narrower. Lip cuneate-oblong, almost entire. Native country unknown. (Glasnevin B. G.; F. Sander & Sons.)

Schizandra chinensis var. **rubra.** (*M. D. G.* 1907, 68.) Magnoliaceae. H. Flowers copper-red. N. China. (C. Sprenger, Vomero, Naples.)

***Scilla cilicica.** (*G. C.* 1908, xliv. 194, f. 81.) Liliaceae. H. Near *S. sibirica*. Bulb larger, bluish violet. Leaves 4–8 in. long, about ½ in. broad at the apex, obtuse, midrib elevated on the underside. Scape slightly taller than the leaves, slightly compressed laterally. Pedicels ½ as long as the flowers. Flowers 2–6, bright blue often tinged with violet, similar in shape and size to those of *S. sibirica*. Filaments white, thread-like. Cilicia, Asia Minor. (W. Siehe, Mersina, Asia Minor.)

Selaginella Emiliana aurea. (*G. C.* 1908, xliv. 253; *G. M.* 1908, 760, f.) Selaginellaceae. S. A yellow-tinted variety. (J. Hill & Son.)

Sigmatogyne Pantlingii. (*O. R.* 1908, 342.) Orchidaceae. S. A little plant, the scape including the flower being only 1¼ in. long. Sepals scarcely ⅜ in. long, oblong. Petals similar, but narrower. Lip entire, oblong, dilated towards the apex. The genus is allied to *Panisea*. Assam. (Sir Trevor Lawrence.)

Sigmatostalix Eliae. (*K. B.* 1908, 416.) Orchidaceae. S. Pseudobulbs compressed, ovate-oblong, scarcely ¾ in. long, 1-leaved at the apex, 2- or 3-leaved at the base. Leaves oblong, ¾–3 in. long, very shortly 2-toothed. Scapes slender, about 7 in. long, many-flowered. Flowers about ⅓ in. long, yellow, spotted with reddish brown. Colombia. (J. Birchenall.)

***Silene laciniata Purpusi.** (*G. M.* 1908, 765.) Caryophyllaceae. H. A dwarf spreading plant. Flowering-stems 6–8 in. high. Leaves narrow, green, somewhat woolly. Flowers rich cardinal-red, produced nearly throughout the summer. Mexico. (W. Artindale & Son.)

Smilax excelsa triangulata. (*M. D. G.* 1907, 256.) Liliaceae. H. Leaves triangular, only about half the size of those of the type. Servia. (Fritz Graf v. Schwerin, Wendisch-Wilmersdorf, Germany.)

Smodingium argutum. (*R. H.* 1908, 384, f. 142.) Anacardiaceae. H. H. A climbing glabrous shrub allied to *Rhus*. Leaves trifoliolate, on long slender petioles; leaflets lanceolate, acuminate, 4–5 in. long, coarsely and sharply toothed. Flowers scarcely ⅛ in. long, in a large panicle. S. Africa. (G. Boucher, Paris.)

Sobralia Lanthoinei. (*T. H.* 1908, 608.) Orchidaceae. G. The flowers appear all together instead of in succession, as is usual in the genus. Colombia. (Duchesne & Lanthoine, Watermael, Belgium.) [*S. Ruckeri*, Linden & Reichb. f.]

Sobralia Siebertiana. (*G. C.* 1908, xliii. 390: *O. R.* 1908, 203.) G. A garden hybrid between *S. macrantha alba* and *S. Hodgkinsoni*. (F. Sander & Sons.)

Sophora japonica columnaris. (*M. D. G.* 1907, 256.) Leguminosae. H. A fastigiate form. (Fritz Graf v. Schwerin, Wendisch-Wilmersdorf, Germany.)

Sophora japonica praecox. (*M. D. G.* 1907, 256.) H. Flowers freely when only 2 years old. (W. F. Niemetz, Temesvár, Hungary.)

Stanhopea costaricensis. (*Orch.* ii. 128.) Orchidaceae. S. Racemes pendulous, 3–6-flowered. Flowers comparable to a pale form of *S. Wardii*, 4½–5 in. across, pale yellow, densely purple dotted, especially in the centre. The lip is remarkable in having 2 prominent keels on each side, and the column has a small trianglar wing at the apex. Reintroduced; it was cultivated in Germany in 1860. Costa Rica. (P. Wolter, Magdeburg, Germany.)

Stanhopea tigrina var. **splendens.** (*Orch.* ii. 61.) S. Distinguished by the deeper colour of its flowers. (Dr. Berliner.)

***Stanhopea tigrina** var. **superba.** (*G. C.* 1908, xliv. 76; *G. M.* 1908, 588, 625, f.; *Gard.* 1908, 379.) S. An exceptionally large and richly coloured form. Flowers cream-yellow, blotched with vivid crimson. (Charlesworth & Co.)

Stokesia cyanea alba. (*G. M.* 1908, 521; *Lemoine Cat.* 1908-9, n. 170, iv.) Compositae. H. H. Flower-heads pure white, with a shade of mauve at the base of the florets. (A. Perry; V. Lemoine & Son, Nancy.)

Tamarix rubella. (*B. S. B. F.* 1907, 256; *J. H. F.* 1907, 613.) Tamaricaceae. H. H. Tree or shrub with sombre red erect branches. Leaves minute, semi-amplexicaul, imbricate, lightly dotted. Bracts ovate, acute, almost as long as the calyx. Calyx-segments 4, oblong. Petals 4, linear-oblong, rose. Stamens 4, with long filaments and dark purple anthers. Algeria. (Algiers B. G.)

Tithonia diversifolia. (*G. C.* 1908, xliv. 24.) Compositae. H. H. Resembles a *Helianthus*. The plant has a broad roundish habit, with spreading robust branches and alternate leaves. Flower-heads about 4 in. across, borne usually 3 together on short thickened peduncles at the end of the branches; ray-florets rich golden-yellow. Mexico. (La Mortola.) [Syn. *Mirasolia diversifolia*, Hemsl.]

Trichopilia Hennisiana. (*Orch.* ii. 99, 121, f. 18.) Orchidaceae. G. Flowers very fragrant, larger than in *T. suavis* or *T. fragrans*, pure white, with 2 zones of golden-yellow on the lip. Sepals and petals lanceolate, shortly pointed, 2¼–3 in. long. Lip somewhat longer, convolute, obscurely 4-lobed. Colombia. (W. Hennis, Hildesheim, Germany.)

Trichopilia nobilis alba. (*G. C.* 1908, xliv. 150; *G. M.* 1908, 660.) G. Flowers pure white, without the yellow blotch usually present. (Charlesworth & Co.) [Syn. *Pilumna nobilis alba*; Gard. 1908, 421. A form of *Trichopilia fragrans*, Lindl., var. *nobilis*.]

Tulbaghia Simmleri. (*B. H. B.* 1908, 988, f.) Liliaceae. G. Bulb ovoid. Leaves lorate-lanceolate, rather obtuse. Scape much longer than the leaves. Flowers small, rose, with ovate-oblong segments; corona urn-shaped, crenately 3-lobed. Transvaal. (W. Barbey, Pierrière, Geneva.)

***Tunica Saxifraga fl. pl.** (*G. C.* 1908, xliv. 35; *Gard.* 1901, 226, 347, June 6, ix. f.) Caryophyllaceae. H. Flowers semi-double, about ½ in. across, of a deeper pink than in the type. (Royal Tottenham Nursery, Dedemsvaart, Holland; G. Reuthe.)

Vanda amoena var. **Sanderae.** (*G. C.* 1908, xliv. 116; *G. W.* 1908, 564; *O. R.* 1908, 275.) Orchidaceae. S. A natural hybrid between *V. Roxburghii* and *V. coerulea*, the latter being the seed-parent. Flowers more handsome than in the type. (F. Sander & Sons.)

Vanda coerulea Charlesworthii. *G. C.* 1908, xliv. 316, 374, f. 160; *O. R.* 1908, 361, f. 44; *G. M.* 1908, 831, f.) S. Flowers large, entirely pure white except a little yellow on the base of the lip. (Charlesworth & Co.)

Vanda suavis pallida. (*G. C.* 1908, xliii. 190; *Gard.* 1908, 188, f.; *G. M.* 1908, 244.) S. Probably identical with *V. suavis Sanderae.* The flowers are cream-white, with numerous yellowish green spots on the sepals and petals. (Th. Pauwels, Meirlebeke, Ghent.)

***Verbascum leianthum.** (*G. C.* 1908, xliv. 171, f. 71; *Gard.* 1908, 509, f.) Scrophulariaceae. H. A robust plant, with very large basal leaves, sometimes 4 ft. long and 2 ft. broad, and a flowering-stem attaining a height of 14 ft., the whole covered with a dense felt of whitish hairs. Inflorescence much branched, up to 7 ft. long and 3½ ft. broad. Flowers ¾ in. across, bright yellow. Asia Minor. (T. Smith, Newry; Glasnevin B. G.)

Verbascum newryense. (*Gard.* 1908, 509.) H. A garden hybrid between *V. Chaixii* and *V. phlomoides.* (T. Smith, Newry.)

Verbesina diversifolia ?. (*G. C.* 1908, xliv. 24.) Compositae. G. A large evergreen bush, about 10 ft. high and nearly as broad. Leaves alternate, bipinnatifid, about 16 in. long including the broadly winged petiole. Flower-heads very numerous, pure white, small, resembling those of some species of *Achillea*, arranged in broad flat cymes on long peduncles. Brazil; Costa Rica. [The plant in cultivation is from the last named country and is possibly not the true *V. diversifolia*, DC.] (La Mortola.)

Viburnum tomentosum var. **lanceatum.** (*Sargent, T. & S.* ii. 109.) Caprifoliaceae. H. "Differs from the type in its more pubescent narrower and smaller leaves, with fewer and less closely set veins." Japan. (Arnold Arboretum.)

Viola cornuta purpurea. (*G. C.* 1908, xliv. 253; *G. M.* 1908, 760; *Gard.* 1908, 501.) Violaceae. H. Flowers rich purple or violet-purple. (Gunn & Sons.)

Viscaria oculata candida. (*Gfl.* 1908, 633.) Caryophyllaceae. H. Flowers pure white, about 2 in. across. (M. Herb, Naples.) [*Lychnis Viscaria*, Linn., var. *alba.*]

Vitex trifolia var. **unifoliolata.** (*M. D. G.* 1907, 69.) Verbenaceae. G. Distinguished by having undivided ovate leaves. Japan. (C. Sprenger, Vomero, Naples.)

Vitis repens. (*Veitch, Nov.* 1908–9, 8, 29, f.) Ampelidaceae. H. A self-clinging strong-growing species. Leaves reddish brown above when young, deep claret colour beneath, the older deep green with a peculiar velvety appearance. cordate-ovate, slightly trilobed, 5–6 in. long. India; China, etc. (J. Veitch & Sons.)

***Warpuria clandestina.** (*K. B.* 1908, 261; *J. R. H. S.* xxxiv. 96.) Acanthaceae. S. The type of a new genus. A dwarf perennial herb with short branches. Leaves opposite, approximate, oblong or oblong-lanceolate, 2½–3 in. long, entire or nearly so, pale green above, with a broad zigzag black band down each side of the midrib. Flowers minute, white, in dense head-like long-pedunculate axillary cymes. Madagascar. (Kew; R. H. Beddome.)

Zephyranthes aurea. (*G. C.* 1908, xliii. 390; *G. M.* 1908, 478; *Gard.* 1908, 325, f.) Amaryllidaceae. G. Leaves narrow, acute, about 1 ft. long. Flowers erect, funnel-shaped, orange-yellow, nearly 3 in. across. See *R. H.* 1904, 166, f. 67. Peru. (Sir Trevor Lawrence.)

Zinnia Haageana stellata. (*Gfl.* 1908, 632.) Compositae. H. H. Florets twisted and acuminate, orange-yellow. (M. Herb, Naples.)

Zizyphus Giraldii. (*M. D. G.* 1907, 69.) Rhamnaceae. H. A fine tree with a slender stem and compact crown. Leaves large, ovate, light green, slightly toothed. Fruits oval, black, edible. N. China. (C. Sprenger, Vomero, Naples.)

ROYAL BOTANIC GARDENS, KEW.

BULLETIN

OF

MISCELLANEOUS INFORMATION.

APPENDIX IV.—1909.

LIST of STAFFS of the ROYAL BOTANIC GARDENS, Kew, and of Botanical Departments, Establishments and Officers at Home, and in India and the Colonies, in Correspondence with Kew.

* Trained at Kew. † Recommended by Kew.

Royal Botanic Gardens, Kew.—

Director - - - - -	Lieut.-Col. D. Prain, I.M.S., C.I.E., M.A., M.B., LL.D., F.R.S., F.L.S.
Assistant Director - - -	Arthur W. Hill, M.A., F.L.S.
Assistant (Office) - - -	*John Aikman.
,, ,, - - -	*William Nicholls Winn.

Keeper of Herbarium and Library	Otto Stapf, Ph.D., F.R.S., F.L.S.
Assistant Keeper (Cryptogams) -	George Massee, F.L.S.
,, ,, (Phanerogams)-	Charles Henry Wright, A.L.S.
,, ,, (Herbarium) -	Nicholas Edward Brown, A.L.S.
,, (Herbarium) - -	*Robert Allen Rolfe, A.L.S.
,, ,, - -	*Sidney Alfred Skan.
,, ,, - -	Thomas Archibald Sprague, B.Sc., F.L.S.
,, ,, - -	Arthur Disbrowe Cotton, F.L.S.
,, ,, - -	Jessie Jane Clark, B.Sc.
,, for Tropical Africa -	*John Hutchinson.
,, for India - - -	William Grant Craib, M.A.

Assistant Keeper (Jodrell Laboratory).	Leonard Alfred Boodle, F.L.S.

(14811—6*a*.) Wt. 108—471. 1375. 12/09. D & S. A

Royal Botanic Gardens, Kew—*continued.*

Keeper of Museums - - -	John Masters Hillier
Assistant (Museums) - - -	*John H. Holland, F.L.S.
,, ,, - - -	*William Dallimore.
Preparer - - - - -	George Badderly.
Curator of the Gardens - -	William Watson, A.L.S.
Assistant Curator - - -	*William J. Bean.
Foremen :—	
Herbaceous Department - -	*Walter Irving.
Arboretum - - - -	*Arthur Osborn.
Greenhouse and Ornamental Department.	*John Coutts.
Tropical Department - -	*Charles P. Raffill.
Temperate House - - -	*William Taylor.
Storekeeper - - -	*George Dear.

Aberdeen.—University Botanic Garden :—

Professor - - -	J. W. H. Trail, M.A., M.D., F.R.S., F.L.S.

Cambridge.—University Botanical Department :—

Professor - - -	A. C. Seward, M.A., F.R.S., F.L.S.
Curator, University Herbarium.	C. E. Moss, D.Sc.
Curator, University Museum.	H. H. Thomas, B.A.
Curator of Garden -	*Richard Irwin Lynch, M.A., A.L.S.

Dublin.—Royal Botanic Gardens, Glasnevin :—

Keeper - - -	Frederick W. Moore, M.A., A.L.S.
Assistant - - -	*C. F. Ball.

Trinity College Botanic Gardens :—

Professor - - -	H. H. Dixon, Sc.D., F.R.S.

Trinity College, Herbarium :—

Keeper - - -	E. P. Wright, M.D., F.L.S.

Edinburgh.—Royal Botanic Garden :—

Regius Keeper - -	I. B. Balfour, M.A., M.D., LL.D., Sc.D. F.R.S., F.L.S.
Assistant (Museum) -	H. F. Tagg, F.L.S.
,, (Herbarium)	*J. F. Jeffrey.
Head Gardener - -	*R. L. Harrow.
Assistant Gardener -	Henry Hastings.

Glasgow.—Botanic Gardens :—

University Professor -	F. O. Bower, M.A., Sc.D., F.R.S., F.L.S.
Curator - - -	James Whitton.

Liverpool.—University Botanical Department :—

	Professor - - -	R. J. Harvey Gibson, M.A., F.L.S.

Oxford.—University Botanic Garden :—

	Professor - - -	SydneyH.Vines,M.A., Sc.D., F.R.S., F.L.S.
	Curator - - -	*William Baker.

AFRICA.

British East Africa Protectorate.—

Nairobi -	Director of Agriculture.	A. C. Macdonald.
	Assistant - - -	*Henry Powell.
	Conservator of Forests	D. E. Hutchins.

Cape Colony.—

Cape Town -	Hon. Curator, Government Herbarium.	Prof. Pearson, M.A., Sc.D., F.L.S.
	Conservator of Forests	J. S. Lister.
	Gardens and Public Parks :—	
	Superintendent - -	H. J. Chalwin.

Grahamstown.—Albany Museum :—

	Director - - -	S. Schönland, Ph.D., F.L.S.
	Gardens and Public Parks :—	
	Curator - - -	E. J. Alexander.
Port Elizabeth -	Superintendent - -	John T. Butters.
King Williamstown.	Curator - - -	George Lockie.
Graaff-Reinet -	„ - - -	*C. J. Howlett.
Uitenhage -	„ - - -	H. Fairey.

Egypt.—

Cairo.—Khedivial Agricultural Society :—

Secretary - - -	G. P. Foaden, B.Sc.

Gold Coast.—Botanic and Agricultural Department :—

Director of Agriculture.	W. S. D. Tudhope.
Travelling Instructor	*Alfred E. Evans.

Gold Coast.—Botanic and Agricultural Department—*continued.*

Curator	- -	- *James Anderson.
,,	- -	- *K. G. Burbridge.
,,	- -	- A. F. Gear.
,,	- -	- *Robert Band.
,,	- -	- *A. C. Miles.
Conservator of Forests		- N. C. McLeod.

Natal.—Botanic Gardens :—

Durban	- -	Director - -	- John Medley Wood, A.L.S.
		Curator - -	- *James Wylie.

Northern Nigeria.—

Conservator of Forests	——

Nyasaland Protectorate.—

Agricultural and Forestry Department :—

Zomba	- -	Director of Agricul- ture. J. S. J. McCall.
		Chief Forest Officer - *J. M. Purves.
		Forester - - - *E. W. Davy.

Orange River Colony.—Department of Agriculture :—

Chief of Forestry Division.	K. A. Carlson.

Rhodesia.—

Bulawayo.—Rhodes Matopo Park :—

Curator - -	- W. E. Dowsett.

Salisbury.—Department of Agriculture :—

Director - -	- Dr. E. A. Nobbs.

Sierra Leone.—Botanic Station :—

Agricultural Superintendent - - -	——

Soudan.—

Khartoum	-	Director of Woods and Forests. A. F. Broun.
		Superintendent of Palace Gardens. *F. S. Sillitoe.
Jebelin	- -	Superintendent of Experimental Plantations. *T. Cartwright.

Southern Nigeria.—Agricultural Department :—

Curator - -	- *William Don.
,, - -	- *H. Dodd.
,, - -	- *R. Gill.
Assistant - -	- *T. B. Dawodu.
Conservator of Forests - -	H. N. Thompson.

Transvaal.—Department of Agriculture :—

Pretoria - -	Botanist - - -	J. Burtt Davy, F.L.S.
	Mycologist - -	†I. B. Pole Evans, B.Sc., F.L.S.
	Conservator of Forests -	C. E. Legat.

Uganda.—Botanical and Scientific Department :—

Entebbe - -	Officer - in - Charge, and Superintendent of Forests.	*M. T. Dawe, F.L.S.
	Assistant - - -	*Robert Fyffe.

Government Plantations :—

Superintendent - -	J. L. Innes-Lillingston.

Zanzibar - -	Director of Agriculture	R. N. Lyne, F.L.S.

Dunga Experimental Station :—

Superintendent -	W. Buzzacott.

AUSTRALIA.

New South Wales.—Botanic Gardens :—

Sydney - -	Director and Government Botanist.	J. H. Maiden, F.L.S.
	Superintendent -	George Harwood.
	Botanical Assistant -	E. Betche.

Technological Museum :—

Curator - - -	R. T. Baker, F.L.S.

Queensland.—

Brisbane - - Colonial Botanist - F. M. Bailey, F.L.S.

Botanic Gardens :—

Director - - -	J. F. Bailey.

Acclimatisation Society's Gardens :—

Secretary - - -	H. J. Johnson.
Overseer - - -	James Mitchell.

Forest Department :—

Director - - -	*Philip MacMahon.

Cairns.—Kamerunga State Nursery :—

Manager - - -	Howard Newport.
Overseer - - -	J. G. Malcolm.

Rockhampton - Superintendent - - R. Simmons.

South Australia.—Botanic Gardens :—

Adelaide - -	Director - - -	Maurice Holtze, Ph.D., F.L.S.
Port Darwin -	Curator - - -	Nicholas Holtze.

Woods and Forests :—

Conservator - -	Walter Gill, F.L.S.

Tasmania.—

Hobart Town -	Government Botanist	Leonard Rodway.
	Chief Forests Officer -	J. C. Penny.
	Botanic Gardens :—	
	Director - - -	Alex. Morton.

Victoria.—Botanic Gardens :—

Melbourne -	Director - - -	—. Cronin.
	National Herbarium :—	
	Government Botanist -	A. J. Ewart, D.Sc., Ph.D., F.L.S.
	Acting Conservator of Forests -	A. W. Crooke.

BERMUDA.

Botanic Station :—

Superintendent - - -	*Thomas J. Harris.

BRITISH HONDURAS.

Botanic Station :—

Curator - - - - - -	Eugene Campbell.

CANADA.

Ottawa - -	Dominion Botanist -	Prof. John Macoun, M.A., F.R.S.C.
	Assistant „	Jas. M. Macoun.
	Director of Government Experimental Farms.	Prof. Wm. Saunders, C. M. G., LL.D., F.R.S.C., F.L.S.
	Director's Assistant and Superintendent of Botanic Garden.	W. T. Macoun.
	Botanist - - -	H. T. Güssow.
	Assistant Botanist -	H. Groh.
Montreal -	Professor of Botany, McGill University.	Prof. D. P. Penhallow, B.Sc., F.R.S.C.

CEYLON.

Peradeniya.—Royal Botanic Gardens :—

Director - - - - - -	†John C. Willis, Sc.D., F.L.S.
Assistant Director - - - -	R. H. Lock, M.A.
Government Mycologist - - -	†T. Petch, B.A., B.Sc.
Superintendent, Experiment Station	C. J. C. Mee, F.L.S.
Curator - - - - - -	*Hugh F. Macmillan, F.L.S.
Superintendent of School Gardens -	C. Drieberg, B.A.
Hakgala - - Curator - - -	**J. K. Nock.**
Heneratgoda - Conductor - -	D. F. de S. Gunaratna.

Maha-iluppalama.—Experiment Station :—

Superintendent - -	C. J. C. Mee, F.L.S.

Nuwara Eliya -	Curator - - -	**J. K. Nock.**
	Conservator of Forests - - -	T. J. Campbell.

CYPRUS.

Principal Forest Officer - -	A. K. Bovill.
Director of Agriculture - -	D. Saracomenos.

FALKLAND ISLANDS.

Government House Garden :—

Head Gardener - - - - -	*A. W. Benton.

FIJI.

Superintendent of Agriculture - -	Charles H. Knowles.

Botanic Station :—

Curator - - - - - -	*Daniel Yeoward.

HONG KONG.

Botanic and Forestry Department :—

Superintendent - - - -	*S. T. Dunn, B.A., F.L.S.
Assistant Superintendent - - -	*W. J. Tutcher, F.L.S.

MALTA.

Argotti Botanic Garden :—

Director - - - - - - Dr. Francesco Debono.

MAURITIUS.

Pamplemousses.—Department of Forests and Botanic Gardens :—

Director	- - - - - -	Paul Koenig.
1st Assistant	- - - - - -	S. E. Pougnet.
2nd „	- - - - - -	F. Bijoux.
Reduit - -	Overseer - - -	W. A. Kennedy.
Forest Officer	- - - - - -	F. Gleadow.

NEW ZEALAND.

Wellington.—Department of Agriculture :—

Biologist	- - - - -	T. W. Kirk.
State Forest Department :—		
Chief Forester	- - -	Henry John Matthews.
Colonial Botanic Garden :—		
Head Gardener	- - -	——
Dunedin - -	Superintendent - -	*D. Tannock.
Napier - -	„ - -	W. Barton.
Invercargill -	Head Gardener - -	——
Auckland -	Ranger - - -	William Goldie.
Christchurch -	Head Gardener - -	*Ambrose Taylor.

SEYCHELLES.

Botanic Station :—

Curator - - - - - - P. R. Dupont, F.L.S

STRAITS SETTLEMENTS.

Straits Settlements.—Botanic Gardens :—

Singapore	-	Director - - -	†H. N. Ridley, M.A., F.R.S., F.L.S.
		Assistant Superintendent.	*R. Derry.
		„ „	*T. W. Main.
Penang - -		Superintendent -	*Walter Fox.

Federated Malay States.—Forest Department :—

	Conservator - -	A. M. Burn-Murdoch.

Kuala Lumpur.—Agricultural Department :—

	Director of Agriculture.	†W. J. Gallagher.
	Assistant Director -	*J. W. Campbell.

Experimental Plantations :—

	Superintendent -	——

Perak (Taiping).—Government Gardens and Plantations :—

	Superintendent - -	*F. R. Long.

WEST INDIES.

Imperial Department of Agriculture :—

Barbados - -	Commissioner - -	Francis Watts, C.M.G., D.Sc., F.I.C., F.C.S.
	Scientific Assistant -	Walter Biffen, B.Sc.
	Mycologist and Agricultural Lecturer.	†F. W. South, B.A.
Antigua :—Government Chemist and Superintendent of Agriculture, Leeward Islands.		H. A. Tempany, B.Sc., F.I.C. (acting).

Botanic Station :—

Curator - - -	*T. Jackson.
Agricultural Assistant	J. H. Roden.

Barbados.—Botanic Station :—

Superintendent -	John R. Bovell, I.S.O., F.L.S., F.C.S.
Agricultural Assistant	J. S. Dash.

Dominica.—Botanic Station :—

Curator - -	*Joseph Jones.
Assistant Curator -	A. G. Jones.

Agricultural School :—

Officer in Charge -	*Archibald Brooks.

Grenada.—Botanic Garden :—

Agricultural Superintendent.	——
Agricultural Instructor	G. F. Branch.

Montserrat.—Botanic Station :—

Curator - - -	*W. Robson.

St. Kitts-Nevis.—Botanic Station :—

Agricultural Superintendent.	F. R. Shepherd.
Agricultural Instructor, Nevis.	J. O. Maloney.

St. Lucia.—Botanic Station :—

	Agricultural Superintendent.	*John Chisnall Moore.
	Agricultural Instructor	T. B. Worm.

St. Vincent.—Botanic Station :—

	Agricultural Superintendent.	*W. N. Sands.
	Agricultural Instructor.	G. Fraser.
Agricultural School :—		
	Officer in Charge -	*W. H. Patterson.

Virgin Islands.—

	Agricultural Instructor.	*W. C. Fishlock.

Bahamas.—Botanic Station :—

	Curator - - -	W. M. Cunningham.

British Guiana.—Department of Science and Agriculture :—

Georgetown -	Director - - -	Prof. J. B. Harrison, C.M.G., M.A., F.I.C., F.C.S.
	Assistant Director and Government Botanist.	F. A. Stockdale, B.A., F.L.S.
	Forestry Officer -	C. W. Anderson.
	Head Gardener -	†John F. Waby, F.L.S.
	Assistant Gardener -	F. Greeves.
	Agricultural Superintendent.	*Robert Ward.

Jamaica.—Department of Agriculture :—

	Director - - -	Hon. H. H. Cousins, M.A., F.C.S.
	Travelling Instructor	*William Cradwick.
	,, ,,	James Briscoe.
Hope Gardens and Experiment Station, Hill Gardens, and Castleton Gardens.	Superintendent -	*William Harris, F.L.S.
CastletonGardens	Assistant Superintendent. -	John Campbell.
Kingston Parade Garden.	Superintendent - -	James Briscoe.
King's House Garden.	,, - -	*William J. Thompson.

Tobago.—Botanic Station :—

	Acting Curator - - -	*W. E. Broadway.
	Agricultural Instructor - -	W. E. Augustus.

Trinidad.—Department of Agriculture :—

Director - - -	Prof. P. Carmody, F.I.C., F.C.S.
Assistant Director and Government Botanist.	J. B. Carruthers, F.L.S.
Mycologist - - -	J. B. Rorer, M.A.
Curator, Royal Botanic Gardens.	*F. Evans.
Overseer - - -	F. G. Scott.
Forest Officer - - -	C. S. Rogers.

INDIA.

Botanical Survey of India :—

Director - - - - -	Major A. T. Gage, I.M.S., M.A., M.B., B.Sc., F.L.S.

Officers associated with Survey :—

Major A. T. Gage, I.M.S., M.A., M.B., B.Sc., F.L.S.	Superintendent, Royal Botanic Garden, Calcutta.
†W. Burns, B.Sc. - - - -	Economic Botanist, Bombay.
†C. A. Barber, M.A., Sc.D., F.L.S. -	Government Botanist, Madras.
†H. M. Leake, M.A., F.L.S. - -	Economic Botanist, United Provinces.

Departments of Agriculture, Botanical Officers attached to :—

Imperial Agricultural Research Institute, Pusa, Bengal :—

Mycologist - - - -	†E. J. Butler, M.B., F.L.S.
Economic Botanist - -	A. Howard, M.A., F.L.S.
Supernumerary Botanist -	†E. Holmes Smith.

Bengal Agricultural Department, Calcutta :—

Economic Botanist - -	E. J. Woodhouse, B.A., F.L.S.

Bombay Agricultural College, Poona :—

Economic Botanist - -	†W. Burns, B.Sc.

Central Provinces Agricultural Department, Nagpur :—

Economic Botanist - -	†R. J. D. Graham, M.A., B.Sc.

Departments of Agriculture, Botanical Officers attached to—*continued.*

Madras Agricultural Department :—

Government Botanist -	†C. A. Barber, M.A., Sc.D., F.L.S.
Mycologist - - -	†W. McRae, M.A., B.Sc.

Punjab Agricultural Department, Lyallpur :—

Economic Botanist -	†D. Milne, B.Sc.

Agricultural College, Cawnpur, United Provinces :—

Economic Botanist -	†H. M. Leake, M.A., F.L.S.

Eastern Bengal and Assam Agricultural Department :—

Economic Botanist -	P. G. Hector, B.Sc.

Department of Economic Products :—

Reporter on Economic Products to the Government of India.	*I. H. Burkill, M.A., F.L.S., Superintendent, Industrial Section, Indian Museum, Calcutta.

BENGAL.

Calcutta.—Royal Botanic Garden, Sibpur :—

Superintendent - - -	Major A. T. Gage, I.M.S., M.A., M.B., B.Sc., F.L.S.
Curator of Herbarium - -	†W. W. Smith, M.A.
Curator of Garden - -	*G. T. Lane.
Overseer - - - -	——
Probationer - - - -	*A. Hardie.

Gardens in Culcutta :—

Assistant Curator - - -	*J. T. Johnson.

Agri-Horticultural Society of India :—

Secretary - - - -	F. Abbott.
Superintendent - - -	P. Lancaster.

Darjeeling.—Lloyd Botanic Garden :—

Superintendent - - -	Major A. T. Gage, I.M.S., M.A., M.B., B.Sc., F.L.S.
Curator - - - - -	*G. H. Cave.

Cinchona Department.—

Superintendent of Cinchona Cultivation and Government Quinologist.	Major A. T. Gage, I.M.S., M.A., M.B., B.Sc., F.L.S.

Cinchona Department—*continued.*

Mungpoo Plantation :—

Assistant Superintendent - - *R. Pantling.
Assistant Manager - - - - *P. T. Russell.

Munsong Plantation :—

Manager - - - - - *J. Parkes.
Assistant Manager - - - - *W. A. Kennedy.
" " - - - - - *H. F. Green.

BOMBAY.

Bombay City.—Municipal Garden :—

Superintendent - - - - C. D. Mahaluxmivala.

Ghorpuri.—Botanic Garden :—

Superintendent - - - - P. G. Kanetkar.

Poona.—Government Gardens :—

Superintendent - - - - *E. Little.

CENTRAL PROVINCES.

Nagpur.—Public Gardens :—

Superintendent - - - - *J. E. Leslie.

MADRAS.

Madras City.—Agri-Horticultural Society :—

Hon. Secretary - - - - L. E. Kirwan.
Superintendent - - - - ——

Ootacamund.—Government Gardens and Parks :—

Officiating Curator - - - *F. H. Butcher.

Cinchona Department.—

Director of Cinchona Plantations - W. M. Standen.
Superintendent, Dodabetta Planta- H. V. Ryan.
tion.
Superintendent, Nedivattam and E. Collins.
Hooker Plantations.

PUNJAB.

Delhi.—Historic and other Gardens :—

Superintendent - - - - *R. H. Locke.

Lahore.—Government Gardens :—

Superintendent - - - -	*W. R. Mustoe.

Agri-Horticultural Gardens :—

Superintendent - - - -	*W. R. Brown.

Simla.—Vice-regal Estate Gardens :—

Superintendent - - -	*Ernest Long.

UNITED PROVINCES OF AGRA AND OUDH.

Agra.—Taj and other Gardens :—

Superintendent - - - -	*A. E. P. Griessen

Allahabad.—Government Gardens :—

Superintendent - - - -	*A. E. Brown.

Cawnpur.—Memorial and other Gardens :—

Superintendent - - - -	*R. Badgery.

Kumaon.—Government Gardens :—

Superintendent - - - -	Norman Gill, F.L.S

Lucknow.—Horticultural Gardens :—

Superintendent - - - -	*H. J. Davies.
Probationer - - - -	*W. Head.

Saharanpur.—Government Botanic Gardens :—

Superintendent - - - -	*A. C. Hartless.

Dehra Dun.—Imperial Forest Research Institute :—

Imperial Forest Botanist - -	R. S. Hole, F.L.S.

EASTERN BENGAL AND ASSAM.

Landscape Gardener and Arboricultural Expert.	*R. L. Proudlock.

NATIVE STATES.

Mysore (Bangalore) :—

Superintendent - - - -	*G. H. Krumbiegel.

Baroda :—

Superintendent - - - -	*B. Cavanagh.

Travancore (Trivandrum) :—

Director - - - -	Major F. W. Dawson.

Udaipur :—

Superintendent - - - -	T. H. Storey.

LONDON:
PRINTED FOR HIS MAJESTY'S STATIONERY OFFICE,
By DARLING & SON, Ltd., 34-40, Bacon Street, E.

1909.